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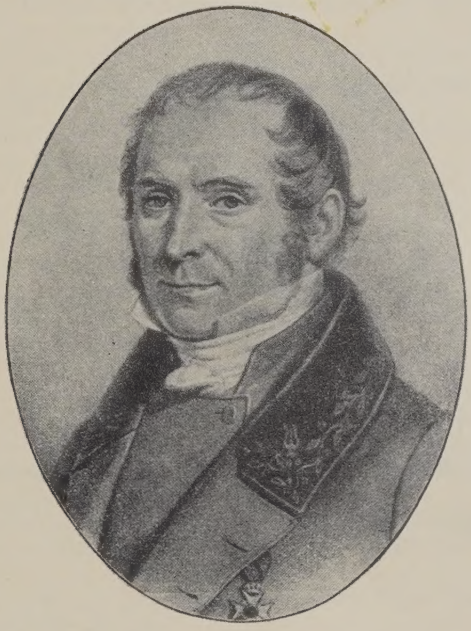

BIND V 1954-1956

KØBENHAVN

1. Hefte, S. 1—134, udkom i Februar 1955
2. — , S. 135—160, — - September 1955
3.—5. — , S. 161—432, — - November 1956
Medlemsfortegnelse, S. (1)—(19), udkom i Februar 1955.

Indholdsfortegnelse og Register udkom i Januar 1959.

*

REDAKTION:

N. F. BUCHWALD F. H. MØLLER

*

Udgivet af Foreningen til Svampekundskabens Fremme.

Hertz - Bogtrykkergaarden, København

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- 117, — 7 f. o.: Fraximus; læs: Fraxinus
- 124, — 15 f. o.: melanthinum; læs: melantinum
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- 312, — 10 f. n.: aurisporus; læs: auriporus

DR. T. J. HINTIKKA

8. FEBRUAR 1888 — 20. JUNI 1952

Von VILJO KUJALA

Der namhafteste unter den wenigen finnischen Mykologen im ersten Dezennium unseres Jahrhunderts war neben Prof. J. I. Liro Dr. T. J. Hintikka. Von dem Leben und Wirken dieses Mannes, der in der Johanniwoche des Jahres 1952 verschied, geben wir nachfolgend einen kurzen Abriss.

Dr. Hintikka wirkte als Lektor der biologischen Fächer an verschiedenen höheren Schulen, später als Assistent in dem botanischen Laboratorium der Agronomisch-Forstwissenschaftlichen Fakultät an der Universität Helsinki und an der Landwirtschaftlichen Versuchsanstalt in Tikkurila. Vom Jahre 1949 an arbeitete er als Dozent für Geschichte der Botanik, und vom Jahre 1925 an war er als literarischer Beirat an einer Verlagsgesellschaft (Valistus) tätig.

Dr. Hintikka interessierte sich speziell für die pflanzenpathologische Forschung und darüber hinaus auch allgemein für die Frage nach den Beziehungen zwischen Kultur und Natur: Die Verbreitungsgeschichte der synanthropischen Pflanzen, die Pathologie und Teratologie der Kulturpflanzen und Bäume, die Schadepilze der Kulturpflanzen und ihre Bekämpfung, die wirtschaftliche Nutzbarmachung der Pilze und ähnliche Gebiete beschäftigten ihn besonders. Diesen Forschungszweigen wollte er auch sein Leben widmen. Da sich ihm jedoch hierfür nicht genügend Möglichkeiten eröffneten, richtete er seine Aufmerksamkeit immer mehr auf sein zweites Spezialgebiet, auf die Geschichte der finnischen Naturforschung und besonders auf die Biographien einzelner Persönlichkeiten. So veröffentlichte er längere oder kürzere Schriften, die das Leben und Wirken des Mykologen P. A. Karsten, des Naturforschers E. Laxman, Carl v. Linné's, des Chemieprofessors P. A. Gadd, des Botanikers Per Kalm, des Astronomen A. J. Lexell, des Arztes und Botanikers Elias Tillandz, des Chemikers Abraham Argillander u. a. behandeln. Als letzte Arbeit nahm er eine Biographie des Reformators des finnischen naturhistorischen Unterrichtes, A. J. Mela, in Angriff und konnte sie fast auch zum Abschluss bringen. Ein ausgeprägtes literarisches Interesse kommt übrigens auch sonst in allen Publikationen Hintikka's zum Ausdruck, in ihnen findet immer die Literatur eine gründliche Behandlung.

Dr. Hintikka war ein äusserst reger und produktiver Verfasser. Die Zahl seiner Veröffentlichungen wissenschaftlichen Charakters übersteigt 200. Von seinen mykologischen Arbeiten seien besonders hervorgehoben die Untersuchungen über: Die Schleimpilze Finnlands (1919), die Brandpilze auf *Festuca elatior,* die Verbreitung des Kartoffelkrebses unter Berücksichtigung der klimatischen Faktoren (Dissertation 1929), den Hexenbesen der Traubenkirsche *(Prunus padus),* sowie ein Programmentwurf für mykogeographische Forschungen, besonders in Finnland. Ferner veröffentlichte er eine grosse Menge kürzerer Artikel und Broschüren, die die schädliche Pilze und ihre Bekämpfung betreffen.

Aus dem pflanzenteratologischen Bereich ist besonders zu nennen ein Verzeichnis über pflanzenteratologische Beobachtungen in Finnland bis zum Jahre 1922 (1924) und langfristige Untersuchungen über die Maserbildung bei der Birke, von denen bedauerlicherweise nur ein kleinerer Teil zur Veröffentlichung gelangt ist. — Dr. Hintikka hat auch viel Zeit auf die Uebersetzung biologischer Werke

in die finnische Sprache verwendet, und eine grosse Zahl populärer, biologischer Artikel und Besprechungen für Zeitschriften und Tageszeitungen entstammen seiner Feder.

Dr. Hintikka war ein scharfsinniger, sensibler Mann. In seiner wissenschaftlichen Laufbahn fehlte es nicht an Missgeschicken. In Aufregung versetzt konnte er in seiner Kritik bisweilen unüberlegt, ja ausfallend werden. So ist es verständlich, dass er immer mehr zum Einsiedler wurde und Stellungen und Ziele nicht erreichte, zu denen er im wissenschaftlichen Leben seines Heimatlandes wahrscheinlich sonst hätte gelangen können. An der Gründung der Finnischen Mykologischen Gesellschaft nahm er jedoch noch rege Anteil und war bis zu seinem Lebensende ihr Vorsitzender. Besonders im Gebiet der Pflanzenpathologie und -teratologie sowie der Geschichte der Naturforschung besitzt Dr. Hintikka's Lebensarbeit offensichtlich einen langewährenden Wert und nimmt einen wichtigen Platz in der Literatur dieser Gebiete in Finnland ein.

Die wichtigsten mykologischen, pflanzenpathologischen und teratologischen Publikationen von Dr. Hintikka.

Die meisten in finnischer Sprache abgefassten Abhandlungen (mit »finn.« in Parenthese bezeichnet) sind mit einer deutschen Zusammenfassung versehen.

1913. Zur Kenntnis der Emergenzen auf den Blättern von Aristolochia Sipho L'Herit. Zeitschr. f. Pflanzenkr. 23, S. 385—393.

1917. Über die Maserbirke und das Vorkommen derselben in Finnland (finn.). Acta Forest. Fenn. 7, S. 209—212.

1917. Flader-, Markflecken- und Maserholz (finn.). Tapio, S. 8—14.

1919. Révision de Myxogastres de Finlande. Acta Soc. F. et Fl. Fenn. 46, S. 1—41.

1919. Über die Basalfäule der Birken (finn.). Tapio, S. 105—110.

1920. Über die nordischen Taphrina-Arten (finn.). L.Y. S. 81—84.

1920. Über die Streifenkrankheit der Gerste (finn.). Maatalous, S. 174—176.

1922. Über die Gelbspitzkrankheit der Getreidepflanzen (finn.). Maatalous, S. 374—376.

1922. Die wichtigsten Fäulnispilze unserer Waldbäume (finn.). Tiede ja Elämä, S. 349—360.

1922. Die „Wisa"-Krankheit der Birken in Finnland. Zeitschr. f. Pflanzenkr. 32, S. 193—210.

1923. Per Adrian Gadd als Pflanzenpatholog (finn.). Valvoja-Aika, S. 405—419.

1924. Tuburcinia festucae-elatioris n. sp. (deutsch). Ann. Soc. Vanamo, 3, S. 105—114.
1924. Über die Verbreitung der Podosphaera oxyacanthae (DC.) de Bary in Finnland (finn.). Medd. Soc. F. et Fl. Fenn. 48, S. 189—191.
1924. Über Kartoffelkrebs in Finnland (finn.). Memor. Soc. F. et Fl. Fenn. 1, S. 42—43.
1924. Die Pflanzenteratologischen Beobachtungen in der finnischen botanischen Literatur bis J. 1922 (finn.). Ann. Soc. Vanamo, 3:2, S. 105—114.
1925. Über die Hexenbesen der Traubenkirsche (finn.). Ibid. 10 S.
1925. Über die Geaster-Arten Finnlands (finn.). L. Y., S. 81—85.
1926. Über den Habitus und Wachstumsart der Wisabirken. Acta Forest. Fenn. 36, S. 209—214.
1929. Über die Kartoffelkrebsforschung und -bekämpfung (finn.). Maat. Aikak, S. 49—59.
1929. Über die Verbreitung des Kartoffelkrebses in den verschiedenen Ländern und über einige klimatischen Umstände in den von demselben verseuchten Gebieten (finn.). Maat. Koet. Julk. 23, 101 S. (Dissert. Abh.)
1929. Die Krankheiten der Kulturgewächse und deren Verhütung (finn.). Maa ja Metsä, I, S. 581—617.
1930. Die wichtigsten Schadepilze unserer Waldbäume (finn.). Ibid. IV, S. 572—602.
1930. Über die Bedeutung des Pflanzenschutzes im Lichte der Statistik (finn.). I-II. Maa. S. 66—70, 118—119.
1931. Über die mykogeographische Forschungsarbeit, besonders in Finnland (finn.). In Selbstverlag. Helsinki. 49 S.
1933. Über die Verbreitung von Phallus impudicus L. in Finnland. Friesia 1, S. 88—90.
1933. Beiträge zur Kenntnis der Kiefern-Hexenbesen. Acta Forest. Fenn. 39, S. 1—15.
1934. Pflanzenteratologische Notizen 1—4. Ann. Bot. Soc. Vanamo, 5:10, S. 3—6.
1934. „Birke in Birke". Ibid., S. 6—7.
1934. Palmér's Birke in Padasjoki. Ibid., S. 7—10.
1935. P. A. Karsten anlässlich seines 100. Geburtstages 16. Februar 1934. Friesia 1, S. 203—229.
1936. Über die Natur des Hexenbesens an der Traubenkirsche (Prunus padus L.). Memor. Soc. F. et Fl. Fenn. 11, S. 173—178.
1936. P. A. Gadd als Bahnbrecher des Pflanzenschutzes im Norden. Acta Agr. Fenn. 33, S. 1—27.
1936. Om masurbjörkarna. Skogsbruket, 2, S. 28—33.
1936. Über Kroppfkiefer (finn.). Metsätal. Aikak. S. 1—4.
1937. Über Apfelbäume mit Antherenschwund und deren Parthenokarpie (finn.). Memor. Soc. F. et Fl. Fenn. 13, S. 110—112.
1937. Beobachtungen über Pinus silvestris L. f. gibberosa Kihlm. (finn.). Memor. Soc. F. et Fl. Fenn. 13, S. 112—116.

1937. Curly and Flamy Birch. Wood (London), 1.
1937. Über das Krankheitsbild und die Ursache der Glasigkeit oder Braunmarkigkeit („Ruskotauti") der Kohlrüben. In Selbstverlag. 41 S.
1937. Sektorial Säfstaholm-Apfel (finn.). Memor. Soc. F. et Fl. Fenn. 14, S. 137—138.
1937. Über die Verbänderung und Hexenbesen der Traubenkirsche (Prunus padus L.). Acta Forest. Fenn. 45, S. 1—153.
1937. Über die Verbreitung und die Verbreitungstheorien des Kartoffelkrebses (finn.). In Selbstverlag. 86 S.
1939. Zur Kenntnis einer Blütenanomalie bei Barbaraea vulgaris R. Br. Memor. Soc. F. et Fl. Fenn. 15 (1938-39), S. 67—79.
1940. Über die Blattanomalien bei Syringa vulgaris L. (finn.). Ibid. 16 (1939-40), S. 78—82.
1942. Eine petaloide Apfelblüte (finn.). Ibid. 17, S. 277—279.
1942. Braunflecken im Holze einer Thuya occidentalis (Tourn.) L. (finn.). Ibid. 17, S. 279—283.
1942. Über einige Schädigungen der Birke. 1-2. — 1. Die durch Spechte verursachte Ringelverwundung. — 2. Die Ringelbildungen der Birke. (finn.). Ann. Bot. Soc. Vanamo, 16:7, S. 1—30.
1942. Über die Wisabirken und ihre Anatomie. 334 S. (nur als Korrekturabzug vorhanden).
1942. Eine Kohlherniepublikation (finn.). In Selbstverlag. 12 S.
1942. Die Rostpilze und Zucker (finn.). In Selbstverlag. 32 S.
1944. Matti Laurila. 1915—1942. Friesia 3, S. 65—66.

LITERATUR

Kujala, Viljo: T. J. Hintikka. 8. II. 1888—20. VI. 1952 (finn.). Karstenia II: 5—8, 1953.

Helsinki, in November 1954.

NOTULAE AD COGNITIONEM HYMENOMYCETUM LAPPONIAE TORNENSIS (SUECIAE)

Auctoribus A. PILÁT et J. A. NANNFELDT

Ever since Torne Lappmark, the vast northernmost province of Sweden (ab. 20600 km^2), was made easily accessible by the opening for traffic of the railway Luleå-Narvik in 1903 it is visited every summer by numerous botanists. The area round Lake Torneträsk (Tornejaure) (sea-level 342 m s.m.), esp. Abisko (68^0 20'N.) and surrounding mountains, has been the most attractive due to its very rich mountain flora with many rare arctic species. Nevertheless, the mycoflora of Torne Lappmark has been very little studied, and still less has appeared in print.

The first part of Torne Lappmark to be investigated mycologically was, however, the area round the church of Karesuando (68° 27'N.), situated on the West bank of the Muonioälv, the border river to Finland, some 150 km E. of Abisko and in the transition zone between the conifer forest region ("reg. silv.") and the subalpine birch forest region ("reg. subalp."). In 1860, C. P. Laestadius listed from here some 120 species of fungi, with very few exceptions all Hymenomycetes. Three species [*Agaricus (Omphalia) lilacinus, Ag. (Naucoria) eximius, Cantharellus hygrophanus*] and one variety [*Ag. (Collybia) butyraceus* var. *tenuior*] were described as new.

Subsequent mycological investigations refer almost exclusively to the Torneträsk area. L. Romell visited it in 1909, 1910, 1915, and 1916 studying esp. the Hymenomycetes and published in 1911 some results of his two first visits, in full as to the Polypores and incidentally as to several genera of leucosporous Agarics. Romell's collections, now the property of Naturhistoriska Riksmuseum, Stock-

holm, have since been subjected in part to critical studies. We cite Schäffer's revision (1939) of the Russulas, in which 22 species are listed from the Torneträsk area, and Neuhoff's (1936) of Romell's (and Nannfeldt's) *Tremellales* with 18 species from Torne Lappmark (17 from the Torneträsk area proper). Romell's collections from Torne Lappmark are cited also e.g. in Pilát's monographs (1935, 1946) of *Pleurotus* (4 species) and *Lentinus* (2 species).

Litschauer examined most of Romell's corticiaceous collections but only very little of his results were ever published. Specimens from Torne Lappmark (collected by Romell and Nannfeldt) are however cited in e.g. Litschauer (1941a, 1941b, and 1944).

Romell gave most attention to the birch woods (reg. subalp.) and studied the higher belts and the conifer region only cursorily. The mycological results of ten days' mountaineering in the Abisko area have been published by the Danish agaricologist Morten Lange (1946), who has recently begun a detailed study of the Agarics of this area.

Amongst papers relating to other groups of fungi from Torne Lappmark the following more comprehensive ones may be mentioned here: the studies on the *Myxomycetes* (24 species) by Rob. E. Fries (1910), on the *Gasteromycetes* (10 species) by Th. C. E. Fries (1914, 1918, 1921) with additions by Sandberg (1940) *(Bovistella paludosa)* and Hertz (1947) *(Geaster minimus)*, on the genera *Taphrina* by Juel (1912) and Palm (1917) (8 species) and *Exobasidium* by Juel (l.c.), and on some aquatic *Phycomycetes* by Gäumann (1918). Notes on *Peronospora* species from the Torneträsk area are to be found in several papers by Gäumann. *Ustilaginales, Uredinales, Pyrenomycetes* (s. lat.), and *Fungi imperfecti* are represented only by stray contributions scattered in the literature. Rytz (1927) has published a uredinologist's impressions of a short visit to Abisko. Numerous Micromycetes of various groups are recorded by Lind (1934) in his "Studies on the Geographical Distribution of Arctic Circumpolar Micromycetes" but the value of this paper is greatly diminished by the untrustworthiness of his determinations.

Nannfeldt has so far visited the Torneträsk area eight times (in the summers of 1923, 1927, 1928, 1935, 1936, 1941, 1943, and 1948). During most of these visits his main object was the study of Discomycetes but all kinds of non-aquatic micromycetes as well as lignicolous Basidiomycetes were collected as well. A list of the Disco-

mycetes of his three first visits was published in 1928, and in several subsequent papers finds from Torne Lappmark have been mentioned and some new species described. In the exsiccatum Lundell & Nannfeldt, Fungi exsiccati suecici, have some 60 Torne Lappmark collections been distributed to date.

With the possible exception of the Dovre mountains (ab. 62° 0' — 20'N.) in Norway, the other parts of the Scandinavian mountain range (the "Scandes") are even less investigated mycologically. Local Agaric floras are treated in only two papers, viz. those by E. Henning (1885, 1887) on Mt. Tronfjell (62° 10' N.) and Mt. Hummelfjell (62° 27' N.) in Österdalen (Hedmark, Norway) and on Western Härjedalen (ab. 62° 35' — 40' N.). Some pieces of information can also be gained from A. Blytt's posthumous paper on the Hymenomycetes of Norway (1905).

*

When A. Pilát visited Sweden in the spring of 1948 and wished to complete his visit by a trip to Lappland, Nannfeldt found an opportunity to accompany him. Our course led us to Abisko where we stayed June 16th — 23rd studying the reg. subalp. and some isolated stands of pine. The season might best be described as rather early spring with the willows still in flower or just past flowering and *Rhododendron lapponicum* in its fullest bloom. The fungus flora also showed a decidedly vernal aspect. The number of Agarics encountered exceeded our expectations, both as to individuals and to species. Pilát found several species to be so interesting that we considered our harvest worth publishing, especially since the vernal aspect of the mycoflora of the Scandes was hitherto totally unknown. In this paper *Agaricaceae* (s. lat.), *Leptotaceae* and *Cyphellaceae* are treated; in the last two families we have made use also of the collections in Naturhistoriska Riksmuseum, Stockholm, and in Uppsala Botaniska Museum. We hope to be able to continue this paper with a second publication devoted to the remaining groups of Hymenomycetes.

It is much too early to dwell upon general considerations concerning the character of the Agaric flora of Torne Lappmark or of the Scandes as a whole. During our visit, one fact was striking to a Swedish mycologist and still more to a mycologist from Central Europe, viz. the frequent occurrence of so many Agarics only a few days after the melting of the snow and at a temperature hardly above 5° C. The frequency of Agarics in Sphagnum bogs and on turfy soil was parti-

cularly striking, since the inhabitants of such localities in more southern lowland regions appear mostly in late summer or in the autumn. In the higher mountains of Central Europe, however, they may again appear rather early.

Undoubtedly, the Agaric flora of Lappland, like the phanerogamic flora, is much poorer in species than those of more southern countries, but also amongst the Agarics certain species are restricted to or are more frequent in subarctic and arctic regions. These northern species, amongst which several novelties are to be expected, seem mainly to be diminutive species of such large and polymorphous genera as *Omphalia* and *Galera*. — It is only natural that mycorrhizal Agarics follow their symbionts to their limits and disappear with them. But it is more remarkable how faithfully other fungi (not only parasites but also saprophytes) may follow the higher plants upon which they are dependent. Numerous examples can be cited from lignicolous Hymenomycetes and from Ascomycetes. Amongst the fungi treated in the present paper, *Marasmius esculentus* proves to follow the pine to its farthest outposts. In this connection it must, however, be kept in mind that the pine stands of the Abisko valley, which to-day appear as isolated outposts, are in fact relics of a continuous pine wood, which covered the valley previous to the climate deterioration some 2500 years ago by which the upper limits of the vegetation belts were depressed at least 200 metres.

The taxonomic part of this paper is almost exclusively the work of Pilát. Nannfeldt has contributed some notes and illustrations on species of *Omphalia* as well as notes on Scandinavian distributions and Scandinavian literature and has revised the Scandinavian materiel of *Leptotus*. The authors are deeply indebted to Dr. S. Lundell for his most valuable and appreciated assistance and informations and to Mr. G. Sandberg, Curator of the "Abisko Naturvetenskapliga Station", who accompanied us on some excursions and whose profound knowledge of the Abisko area has been of much use to us. Mr. O. Mårtensson has kindly determined some mosses for us, and Mr. John Eriksson some fungi. Drs. G. Haglund and I. Jörstad have kindly sent on loan material from "Naturhistoriska Riksmuseum", Stockholm, and "Universitetets Botaniske Museum", Oslo.

AGARICACEAE

Coprinus Boudieri Quél. (Fig. 1).

Abisko, in carbonariis, 20.VI.1948, G. Sandberg. — Ibid., inter »Naturvetenskapliga stationen« et viam ferream, 21.VI.1948. P. & N. (n. 9083).

Specimina lapponica cum descriptionibus iconibusque condordant. Cfr. Imler, Bull. Soc. Myc. Fr. 54:122-126, Tab. II, 1938. — Josserand, ibid. 54:127-131, 1938; ibid. 60:14-18, 1944. — Konrad & Maublanc, Ic. Sel. Fung. tab. 37:II, 1924-30. — Rea, Trans. Brit. Myc. Soc. 12:219, 1927.

Fig. 1. *Coprinus Boudieri* Quél.
Carposomata (nat. size), pileus sectus et sporae (ca. × 2500). — A. Pilát del.

Pileus ca. 2 cm altus, e glanduliformi campanulatus, pallide ochraceus, cacumine brunneus, udus totus obscurior, usque ad cacumen ad dorsa lamellarum obscurius, radialiter rimosus. — Lamellae liberae, mox griseae, dein nigrae, acie albidae. — Stipes 40—60 × 3—4 mm, candidus, lucidus, adultus glaber et paulo obscurior. — Sporae in cumulo nigrae, mitriformes, apice poro germinativo magno instructae, compressae, 9—11 × 7—8 × 5—6μ.

Species sporis characteristicis et natura habitationis facile agnoscenda. [P.]

This carbonicolous species is probably distributed all over Sweden, although it is much overlooked due to its extremely ephemeral fruitbodies. I have collected it in a mountain valley in Jämtland, in the upper part of the reg. silv. (Åre par., Storvallen, 30. VII. 1950, N. n. 10916.) [N.]

Coprinus hemerobius Fr.

Abisko, prope castra militaria, ad viae marginem, ad terram turfosam excrementis equinis permixtam, 21.VI.1948, P. & N. Carposoma singulum visum.

Pileus sordide alutaceus, radialiter rimosus, campanulatus, ca 1 cm altus, glaber. Lamellae cinereae, demum sordide nigricantes. — Stipes cylindraceus, hyalinus, laevis vel minime albo-pruinosus. — Sporae ellipsoideae, laeves, brunneae, poro germinativo parvo, pallidiori instructae, 11—13×7—7,5 μ.

Stropharia magnivelaris Peck ap. Sacc., Peck & Trelease in Harriman, Alaska Exped. 5:44, 1904. — Saccardo, Syll. fung. 17:86, 1905. — Murrill, Mycol. 4:301, 1912. — (Fig. 2).

Syn.: ? *Agaricus (Stropharia) Percevalii ("Percevali")* Berk. & Br., Ann. & Mag. Nat. Hist. 5:3:206, 1879. (= Notes Brit. F. n. 1767). — Cooke, Ill. Brit. F. tab. 554 (550) (1884—86): Handb. p. 197, 1883. — Massee, Brit. F. Fl. 1:396, 1892. — Rea, Brit. Basidiom. p. 125, 1922.

In declivitate septentrionali montis Nuolja, infra ostium occidentale tubi viae ferreae, ad viae marginem, ad terram frustulis ligneis permixtam, 18.VI.1948, P. & N. (n. 9792). Specimina ca 25, iuvenilia. Sporae 13—18 × 9—9,5 μ. — In declivitate orientali montis Nuolja, ad ripam rivuli Ridonjira, ca. 450 m s. m., ad terram in saliceto humili, 20.VI.1948, P. & N. (n. 9789). Specimina copiosissima, ca. 200. Sporae 13—16,5 × 7,5 —9 μ. Haec collectio edetur in Lundell & Nannfeldt, F. exs. suec. — Abisko, prope stationem viae ferreae, loco ruderali ad terram scobibus et aliis frustulis ligneis permixtam, 22.VI.1948, P. & N. (n. 9790). Specimina admodum magna, pileo usque ad 6 cm diam. Sporae 14,5—19 × 7,5—9 μ.

Fungus valde variabilis. Pileus iuvenilis (dum clausus) 1,5 cm diam. et 1—1,25 cm altus, plerumque sat acute conicus, conico-umbonatus vel semigloboso-convexus et umbonatus; adultus convexus et apice saepe planus, vix umbonatus, 2—3 cm diam., rarius usque 6 cm diam., magnitudine et forma valde variabilis; pallide ochraceus, non vel vix hygrophanus, superficie viscidus, laevis, primum residuis veli universalis, pileo concoloribus, parce obtectus, praecipue margine squamulis crebris, etiam e velo universali ortis, ad velum partiale

Fig. 2. *Stropharia magnivelaris Peck.*
Carposomata (ca. × ½) et sporae (ca. × 1000). — 1-5. P. & N. n. 9790. — 6-12. Specimina iuvenilia. P. & N. n. 9792. — 13-21. P. & N. n. 9789. — A. Pilát del.

adiacentibus ornatus et saepe fimbriato-squamulosus, margine deflexus sed vix involutus, in speciminibus adultis saepe sat planus et parum umbonatus, love sicco squamulis agglutinatis obscurioribus ornatus et tum saepe cute paulo radialiter fissa. — Lamellae subadnatae usque emarginatae, primum griseo-caeruleae, pallide papaverinae vel azureo-papaverinae, dein umbrinae, acie albae, usque 1 cm latae. — Stipes cylindraceus, basi parum incrassatus, rarius in speciminibus magnis basi subclavatus, solidus, dein farctus usque

subcavus, albus vel tinctu ochraceo-lutescenti, 4—10 × 0,3—0,5 (—1,5) cm, usque ad annulum modice transverse squamulosus, supra annulum albus et albo-furfuraceus, adultus squamulis adpressis fibrillosus, haud squarrosus. Basis stipitis plerumque radiculo funiculiformi myceliali albo, in speciminibus iuvenilibus magis manifesto, cum frustulis ligneis coniuncta. — Annulus conspicuus, membranaceus, patens, subtus fibrilloso-squamulosus, albidus vel tinctu lutescenti, stipiti concolor, supra regulariter radialiter striatus et sporis subnigris pulverulentus; rarius annulus ruptus et partes eius margine pilei haerent, in speciminibus adultis plerumque collapsus et stipiti agglutinatus. — Caro pilei odore haud perspicuo, sapore miti, in speciminibus madidis in pilei superficie albida, ad lamellas sordide aquosa, in stipite alba, in basi stipitis brunnea, in speciminibus siccis alba, in dimidio inferiori centrali stipitis solum fuscidula. — Sporae in cumulo nigrae tinctu purpurino-violaceo, ellipsoideae, basi apiculo minimo, paulo obliquo et apice poro germinativo conspicuo et magno instructae, magnitudine admodum variantes, 13—19 × 7,5—9,5 μ. — Cystidia in acie lamellarum ca. 60×4—6 μ, saepe caespitosa.

Adnotationes: Fungus lapponicus cum descriptionibus *Str. Percevalii* B. & Br. satis concordat. Sporae huius speciei teste Cooke et Rea 16—17 × 7 μ; Massee sporas paulo minores (12—14 × 6 μ) indicat. — Cl. Seth Lundell in epistula fungum lapponicum cum *Str. magnivelari* Peck identicum esse aestimat. Sporae huius speciei alaskanae (teste Peck) 14—16×7—8 μ. Murrill (l.c.) ad hanc speciem adnotat: "The types at Albany resemble *S. stercoraria,* but have a larger ring, darker gills, and a more radiate-rugose or subsquamose cap." Non dubito quin determinatio Lundellii bona sit. Sed identitas *Str. Percevalii* valde incerta est. Ut videtur, mycologici britannici recentiores hanc speciem nesciunt, et in enumeratione agaricacearum britannicarum Pearson & Dennis (Trans. Brit. Myc. Soc. 31:183, 1948) dicunt: "*Str. Percevalii* B. & Br. — left in list through much like *Hornemannii* except that spores are much larger sec. Cke. Ill. 554 (550)."

Str. magnivelaris, quam prima vere regionis abiskoensis in magna multitudine ad terram frustulis ligneis permixtam crescentem observavimus, verosimiliter species borealis et subarctica circumpolaris est. Haec species in proximam affinitatem *Str. Hornemannii* (Fr.) [= *Str. depilatae* (Pers. ex Fr.)] et *Str. squamosae* (Pers. ex Fr.) pertinet, quarum carposomata aestate et autumno apparent.

Omnes tres species lignophilae vel potius semilignophilae oecologia sua a *Strophariis* coprophilis, quae habitu saepe valde similes sunt, discrepant. Omnes tres quoque boreales sunt: in zona subarctica *Str. magnivelaris* praevalet, paulo ad meridiem in silvis *Str. Hornemannii* crescit et *Str. squamosa* praecipue in continente europaeo distributa est. [P.]

Two collections of this species (det. S. Lundell) from north Sweden have recently been received at the Uppsala Botanic Museum, viz. one from Norrbotten (Övertorneå, refuse heap on the railway bank, VI.1951, O. Lönnquist) and one from Jämtland (Åre par., Handöl, Brännan, old manure heap, 30.VII.1951, N. n. 11626). Dr. Lundell has also informed us about a collection from north Norway, some 10 km from the Torne Lappmark boundary (Troms fylke, Lyngen h:d, Signaldalen, Vassdalen, in grass land, c. 75 m s. m., 1.VIII.1933, H. Smith).

A. Blytt (1905:62) reports *Str. squamosa* from three Norwegian localities, one in the Dovre mountains (62° 20' N., c. 920 m s. m.) and two in Troms fylke (Tromsö and Reisendalen). The specimens from Dovre and Tromsö are in the Oslo herbarium, and on examining them Dr. Lundell also recognized *Str. magnivelaris*. In view of the lack of specimens it remains an open question to what extent the old reports of *Str. squamosa* from north Sweden refer to *Str. magnivelaris*. Such records are e.g. those from Torne Lappmark (Karesuando) and Norrbotten (Pajala) by C. P. Laestadius (1860:32) and that from Härjedalen (Tännäs par., Malmagen) by E. Henning (1885:41). [N.]

Inocybe descissa (Fr.) var. **auricoma** (Batsch ex Fr.) Heim. — Cfr. J. E. Lange, Fl. Agar. Dan. 3:74, tab. 113 B, 1938.

Abisko, ad terram, 17.VIII.1915, L. Romell (Hb. Romell n. 9889 ut *Flammula scamba)*.

Sporae pallide argillaceae, laeves, ellipsoideae, oblique apiculatae, 10—11 × 5,5—5,7 μ. — Cystidia in acie lateribusque lamellarum numerosa, lageniformia, crasse tunicata et apice muricellata, 30—40 × 10—18 μ.

Pholiota (Kühneromyces) mutabilis (Schaeff. ex Fr.) Quél.

Pessijokk, 16.VIII.1915, L. Romell (Hb. Romell n. 9762).

Pholiota (Agrocybe) praecox (Pers. ex Fr.).

Abisko, 20.VI.1948, G. Sandberg. — Inter Abiskojokk et Nuolja, ad semitam, 23.VI.1948. Ålund.

Pholiota (Pholiotina) togularis (Bull. ex Fr.) sensu Ricken. — (Fig. 3). — Cfr. Kühner, Le Genre Galera p. 161, 1935.

Haec species sat variabilis in regione abiskoensi late distributa est et tempore vernali occurrit. Formae tetrasporae et bisporae observavimus:

1) fa. *typica:* tetraspora, sporis 9,5—11×5,5 μ.

Abisko, loco udo turfoso, inter *Tomenthypnum trichoides,* copiose, 21.VI.1948, P. & N. (n. 9087). (Fig. 3:1—9.) — Ibid., prope stationem viae ferreae, 22.VI.1948, P. & N. (n. 9088). Forma paulo discrepans carposomatibus paulo majoribus, pileis usque ad 20 mm diam., sporis 10—13 × 5,5—5,7 μ.

Fig. 3. *Pholiota togularis* (Bull. ex Fr.) sensu Ricken.
Carposomata (ca. × 4/5), basidia, sporae et cystidia (ca. × 1200). — 1-9. fa. *typica.* P. & N. n. 9087. — 10-17. fa. *latispora* Pilát. P. & N. n. 9089 (typus). — 18-24. fa. *teneroides* (J. E. Lge). P. & N. n. 9090. — A. Pilát del.

Pileus primum subsemigloboso-convexus, 4 mm diam., dein magis conicus, adultus subplanus, parum umbonatus, 15—25 mm diam., distincte hygrophanus usque ad dimidium hemidiametris pellucide striatus; udus, laevis, glaber, subaurantio-ochraceus vel aurantio-rubro-brunneus (vulpinus); semisiccus pallide ochraceus usque albide ochraceus, cacumine diu obscurior, dein concolor; margine haud involutus, tenuissime carnosus, margine lamellas haud superans. — Lamellae confertae, angustato-adnatae, paulo ventricosae, primum albidae, pallide lutescentes, dein rubeolo-luteo-fuscae, relativiter pallidae, acie subconcolores. — Stipes tenuiter cylindraceus, primum 30 mm, dein usque 50—60 mm longus et 1,2—3 mm crassus, primum pileo concolor, dein obscurior apice solum pallidior, deorsum obscurior, praecipue dimidio inferiori albido-fibrillosus. — Annulus tenuiter membranaceus, albus vel albidus, superne rimosus. — Caro stipitis sat obscure fusca, apice pallidior; pilei tenuissima, uda vulpina. — Basidia tetraspora. — Sporae ellipsoideae, poro germinativo instructae, 9,5—11 × 5,5 μ. — Cellulae globosae in pilei superficie 18—25 μ diam.

2) fa. *latispora* Pilát fa. n.: tetraspora, sporis latioribus, 11—13 ×6,5—7,5 (—8,5) μ. — (Fig. 3:10—17.).

Abisko, ad castra militaria, in sphagnetis, aqua gelida imbutis, ca. 35 carposomata in gregibus ca. 6 speciminibus coniuncta, 22.VI.1948, P. & N. (n. 9089. Typus.). Stipes totus in musco conditus est, qua de causa pileus solum visibilis est. Basis stipitis in aqua fere submersa, mycelium verosimiliter in aqua algida crescit.

Pileus 10—15 (—20) mm diam., primum late conicus, obtuse umbonatus, rarius semigloboso-convexus, modice umbonatus, adultus margine elevatus et distincte umbonatus, udus vivide obscure vulpinus, aurantio-ferrugineus, semisiccus pallide ochraceus, paulo lucidus et minime viscosus, elasticus, haud fragilis, margine lamellis translucescentibus parum striatus, laevis, relativiter carnosus, iuventute cum stipite velo membranaceo coniunctus. — Lamellae vulpinae, udae, pilei paulo pallidiores, ventricosae (ca. 4 mm latae), angustato-adnatae, acie concolores, haud denticulatae. — Stipes cavus, 25—40 × 2 mm, cylindraceus vel parte basali paulo crassior, fragilisque et ibi tomento aquose albido muscis vivis affixus, pileo concolor, in parte tertia superiori annulo manifesto instructus, sub annulo albide argenteo-fibrillosus, supra annulum sparse albide pruinosus. — Annulus membranaceus, albidus, superne paulo rimosus et e sporis luteo-ferrugineis pulverulentus. — Caro pilei ca. 1 mm crassa, centro

crassior, uda pileo concolor et similis in stipite. — Basidia tetraspora. — Sporae late ellipsoideo-subamygdaliformes, poro germinativo parvo instructae, ferrugineae, 11—13 × 6,5—7,5 (—8,5) μ. — Cheilocystidia sublageniformia, 25—38 × 7—10 μ.

A forma typica dimensionibus paulo majoribus, lamellis minus pellucescentibus et sporis latioribus discrepat.

3) fa. *teneroides* (J. E. Lge., non Peck): bispora. (Fig. 3:18—24.). — Cfr. Kühner, Le Genre Galera p. 162, 1935.

Abisko, prope stationem viae ferreae, loco graminoso ad terram in fossa, 21.VI.1948, P. & N. (n. 9090).

Pileus 10—15 mm diam., pallide luteo-ochraceus, glaber, laevis, semiglobosus, haud umbonatus, primum cum stipite velo membranaceo coniunctus, vix hygrophanus et vix vel minime striatus, statu semisicco parte marginali paulo rugosus. — Lamellae pallide ochraceae, fere albidae, dein obscuriores, pallide ochraceae et etiam statu semiadulto diu pallidae, subconfertae, adnatae et paulo emarginatae, acie sub lente ciliatae, semisiccae obscurius coloratae, ochraceo-brunneae. — Stipes regularis, cylindraceus, basi vix incrassatus, 30—40 × 1—1,5 mm, pallide albido-ochraceus, pilei paulo pallidior, subtiliter fibrillosus, tactu paulo obscurius maculans, fragilis, cavus. — Annulus membranaceus, subgossypinus, superne parum rimosus. — Caro stipitis, praecipue parte basali, brunnea. — Basidia bispora, 20—25 × 6—7 μ, sterigmatibus magnis. — Sporae ellipsoideae, poro germinativo instructae, 11—13 × 6—7 μ.

Galerina clavata (Vel.) Kühner, Le Genre Galera p. 171, 1935. — (Fig. 4).

Syn.: *Galera fragilis* Vel. var. *clavata* Vel., České houby p. 548, 1921; Op. Bot. Čech. 6:208, 1948. — *Galera hypnorum* (Batsch ex Fr.) var. *macrospora* R. Maire, Bull. Soc. Myc. Fr. 44:49, 1928.

Abisko, prope castra militaria, in musco udo terrae turfosae, 21.VI.1948, P. & N. (n. 9085). Cum speciminibus bohemicis gallicisque et cum descriptione Kühneri bene concordans.

Pileus 5—15 mm diam., e subconico late campanulatus, rarius adultus margine paulo arcuato-elevatus, udus vulpino-aurantiacus, manifeste hygrophanus, e lamellis translucescentibus margine striatus, semisiccus pallide ochraceus, laevis, iuventute margine pilei cortina alba, arachnoidea, mox evanescenti, ornatus. — Lamellae pallidiores, subaurantiaco-lutescentes, subdistantes, profunde emargi-

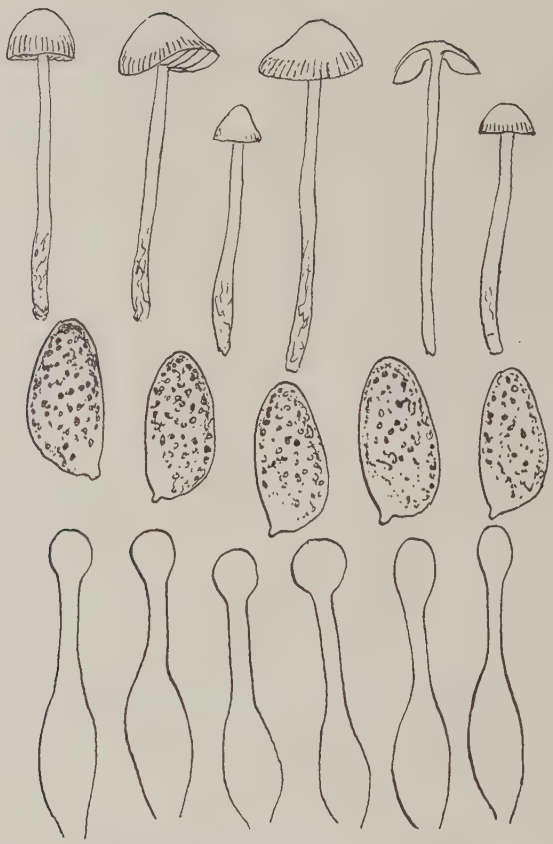

Fig. 4. *Galerina clavata* (Vel.) Kühner.
Carposomata (nat. size), sporae (ca. × 1500) et cystidia (ca. × 1200). — P. & N. n. 9085. — A. Pilát del.

natae. — Stipes 30—50×1—2,5 mm, cylindraceus, deorsum minime incrassatus, pileo concolor, praecipue dimidio inferiori fibrillis albis arachnoideisque ornatus, apice sub lente paulo pruinosus, parte basali pallidior, magis aquosus. — Basidia tetraspora. — Sporae in cumulo ferrugineae, ellipsoideae, absque poro germinativo, pallide luteo-ferrugineae, adultae extus laeves, exosporo laevi, hyalino, endosporo minime [?] verruculoso, ferrugineo instructae, 13—15×6,7—7,5 μ. — Cheilocystidia sublageniformia, 30—40 μ longa, capite globoso apicali, 7 μ diam., instructa, parte coliformi 3 μ crassa.

Galerina pseudomycenopsis Pilát sp. n. — (Fig. 5).

Abisko, ad castra militaria loco turfoso, inter muscos altos vivos udosque (*Tomenthypnum trichoides* et *Aulacomnium palustre*), 21.VI.1948, P. & N. (n. 9084. Typus.).

Pileus 10—25 mm diam., plane campanulatus vel convexus, apice rotundatus, haud umbonatus, dein cacumine subplanus, rarius vetustus centro subdepressus, laevis, hygrophanus, margine e lamellis parum pellucescentibus striatus, relativiter crasse carnosus et elasticus, sat laete coloratus, subvulpinus, udus sed non viscidus, glaber. — Caro subtenuis, subinodora. — Lamellae late adnatae, subdistantes, e albido luteo-fuscescentes, adultae pallide lutescenti-vulpinae, stipiti subconcolores. — Stipes 30—40 × 2—4 mm, rectus vel subundulatus, relativiter brevis, pileo subconcolor, iuventute pallidior et cortina albo-fibrillosa vel arachnoidea, mox evanescenti, ornatus, dein subnudus, laevis glaberque, basi paulo albo-tomentosus tomento albido muscis coniunctus, subelasticus, haud fragilis, cavus. — Basidia tetraspora, 20—30 × 6,5—8 μ. — Sporae distincte amygdaliformiter ovoideae, usque ovoideo-subfusiformes, apice poro germinativo parvo sed distincto plerumque protracto, ornatae, ferrugineae, laeves,

Fig. 5. *Galerina pseudomycenopsis* Pilát.
Carposomata (ca. × $^{9}/_{10}$), sporae (ca. × 1400) et cystidia (ca. × 1100). — P. & N. n. 9084 (typus). — A. Pilát del.

11×7 μ. — Cheilocystidia in acie lamellarum subconico-cylindracea, apice rotundato-incrassata et basi minime lageniformiter inflata, 40—60 × 6—7 μ, parte coliformi solum 2,5—3,5 μ crassa, hyalina et tenuiter tunicata. — Pleurocystidia nulla.

Fide cl. John Eriksson haec species ad gregem *Naucoriopseos* pertinet. *G. mycenopsis* (Fr.) sensu Kühner quae similis, sporis ellipsoideis, potius elongatis, haud amygdaliformibus, 8,5—13 × 5—6,5 μ absque poro germinativo distincto ad gregem *Eu-Galerinae* pertinet.

Crepidotus Lundellii Pilát ap. Lundell & Nannf., F. exs. suec. n. 220 (= Fasc. 5—6:10), 1936. — Cfr. Pilát, Atl. Champ. de l'Eur. 6:48, 1948.

In declivitate orientali montis Nuolja, prope ostium rivuli Ridonjira in flumen Abiskojokk, ad ligna putrida *Salicis phylicifoliae,* 20.VI.1948, P. & N. (n. 10000). Specimina ex anno praecedenti, sporis latiuscule ovoideo-amygdaliformibus, laevibus, 7—8 × 5—5,5 μ.

Omphalia ericetorum (Fr. ex Fr.). — (Fig. 6).

Syn.: *O. umbellifera* (L. ex Fr.) Quél. — Cfr. Lundell & Nannf., F. exs. suec. n. 1753 (= Fasc. 35—36:28), 1949.

Species in Lapponia tornensi valde copiosa et frequens!

In pede boreali montis Nuolja, infra tubam viae ferreae, ad viam, 18.VI.1948, P. & N. (n. 9095). Sporae ovoideo-piriformes, 9,2 × 6 μ. — Abisko, 21.VI.1948, P. & N. (n. 9720). Sporae ovoideo-piriformes, 9—11 × 5,5—6 μ. (Fig. 6 f). — Ibid., in via prope castra militaria, ad terram turfosam in muscis humilibus, 21.VI.1948, P. & N. (n. 9787). In Lundell & Nannf., F. exs. suec. sub n. 1754, edita. Sporae ovoideo-piriformes, 9—11 × 6—7,5 μ. — Ad semitam inter Abisko et Paddos, 17.VI.1948, P. & N. (n. 9096). Sporae ovoideo-piriformes, 9—10 × 6—7,5 μ.

Collectio paulo aberrans describo:

fa. *brunneo-papillata* Pilát fa. n. — (Fig. 6 h).

Abisko, ad viam prope castra militaria, ad terram turfosam in muscis humilibus, 21.VI.1948, P. & N. (n. 9098. Typus.).

Pileus 10—15 mm diam., subplanus, centro saepe papilla conspicua, semiglobosa sat magna, ornatus, rugosus, glaber, e lamellis translucescentibus ad marginem manifeste striatus, sat hygrophanus, udus pallide brunneus tinctu olivaceo cum striatione pallidiori, Iove sicco pallide sordide ochraceus, tenuiter membranaceo-carnosus et subdiaphanus. Lamellae distantes, decurrentes, late triangulares, pallide griseo-fusco-luteolae, dein acie nigricantes. Stipes cylindra-

ceus, 15—20×1—2 mm, laevis, luteo-brunneus. — Basidia tetraspora vel bispora, 25—35 × 6—10 μ. — Sporae ellipsoideae usque ovato-piriformes, hyalinae, laeves, magnitudine sat variantes, 8—11,5 × 5—6 μ [P.].

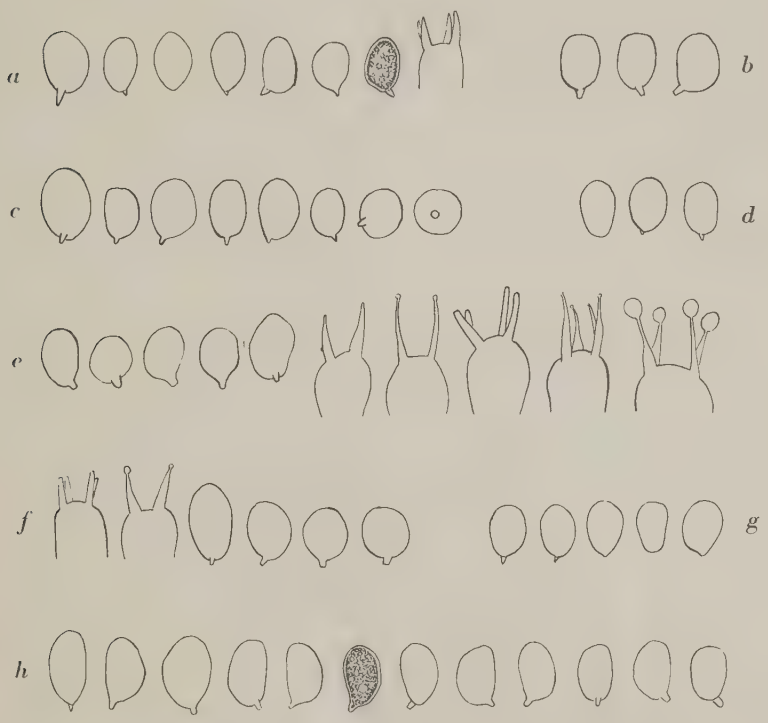

Fig. 6. *Omphalia ericetorum* (Fr. ex Fr.).
Spores and basidia (ca. × 1000). — a. Abisko (Romell n. 8855). Herbarium material soaked in ammonia and transferred to glycerine. — b. Ditto transferred to lactic blue. — c. Uppsala (21.V.1946, A. Melderis, Hb. Ups.). Lactic blue. — d. Torne Lappmark, Riksgränsen (VII. 1903, J. Vleugel, Hb. Stockh.). Glycerine. — e. Jämtland (N. n. 11666). Lactic blue. — f. Abisko (P. & N. n. 9720). Lactic blue. — g. Vassitjåkko (30.VIII.1909, Romell, »stipe violet«). Glycerine — h. fa. *brunneo-papillata* Pilát (typus). Lactic blue. — J. A. Nannfeldt del.

O. ericetorum is a very common species growing all over Sweden, esp. on peaty soil. It increases in frequency towards the north and ascends rather high in the mountains. Its upper limit cannot be fixed, due to confusion with *O. luteovitellina* (see below). It is very variable

both as to shape and to colour while the microscopical features are stable. The variability is to a large extent due to the environmental conditions. The accompanying drawings (fig. 6) show spores and basidia of gatherings that are very divergent in general appearance.

In one specimen (Jämtland, Åre par., Brännan, 2.VIII.1951, N. n. 11666) studied cytologically, the nuclei behaved normally, the basidial primordia containing two nuclei, which later fuse, and the fusion nucleus eventually dividing twice. In this specimen as well as in others studied by me, the number of spores per basidium is nevertheless variable. Different gatherings show perhaps a different ratio between 4-spored and 2-spored basidia. The attempt by F. H. Möller (1945: 257—260) to distinguish, in the Faeröes, one sphagnicolous 2-spored species *(O. pseudo-androsacea)* and one mainly 4-spored species growing among other, low mosses *(O. umbellifera,* with a 2-spored race, fa. *bispora)* is not applicable to the Scandinavian population.

In addition to the colour variation resulting from environmental conditions there evidently exist genetically based colour races, which at least in part have been regarded as separate species. Here belongs *e.g. Agaricus lilacinus* C. P. Laestadius (1860 p. 45) described from Torne Lappmark (Karesuando par., Karavaara) as close to *O. ericetorum* and with „pileus often and stipe always pale-violet" and „gills yellow". Ingelström (1940:155) gives it as „not rare" on peaty soil in the mountains „*e.g.* Abisko (15/7 1924)". Nevertheless, I have never succeeded in finding it. In Hb. Romell there is a gathering (Vassitjåkko, 30.VIII.1909:75) of *O. ericetorum* with a note: „stipe violet". And the Uppsala Museum possesses a gathering preserved in alcohol, labelled *„Omphalia lilacina.* Jämtland, Åre par., Renfjället, reg. alp., 18.IX.1885, E. Henning". Both these numbers were studied microscopically and found to agree with typical *O. ericetorum.* [N.].

Omphalia luteovitellina Pilát & Nannf. sp. n. — (Fig. 7—8).

Syn.: *O. flava* (Cke) F. H. Möller, Fungi of the Faeröes 1:260, 1945, sensu Möller sed non sensu orig. Cooke (*Agaricus umbelliferus* var. *flavus* Cke = var. *abiegnus* B. & Br.) — ? *Cantharellus dovrefjeldiensis* P. Henn. & Kirschst., Hedw. 41: (62), 1902.

Katterjokk (prope Riksgränsen), reg. alp., ad terram, ca. 700 m s. m., 22.VI.1948, Ålund (Typus). Tria carposomata solum.

Specimina e pluribus locis montium suecicorum a Nannfeldt examinata sunt: Herjedalia, par. Tännäs, Hamrafjället, juxta cacumen boream versus, in rupe schistae calciferae, reg. alp. infer., ca. 1125 m s. m., 16.VII.1948, G. Degelius (Hb. Ups); Lillskarven, in ipsa cacumine (1222 m s. m.), ad terram nudam, reg. alp., 10.VII.1947, Th. Arwidsson & G. Haglund (Hb. Holm); par. Storsjö, Helags, ad merid-occid. a cacumine altissimo, reg. alp., ca. 1495 m s. m., 18.VII.1947, Th. Arwidsson & G. Haglund (Hb. Holm); Jelgatsåive (»Jalgatsåjja«), cacumen (1188 m s. m.) versus, reg. alp., in Loiseleurieto, 15.VII.1947, Th. Arwidsson & G. Haglund (Hb. Holm). — Jemtlandia, par. Åre, Snasahögarna, Storsnasen, in declivitate bor.-occid., reg. alp., 1250—1350 m s. m., 31.VII 1951, Ragnhild & J. A. Nannfeldt (n. 11645) (Hb. Ups.). — Lapponia tornensis, par. Karesuando, Peldsa, in declivitate orientali cacuminis merid.-orientalis, reg. alp., ca. 1000 m s. m., 26.VII.1948, Th. Hasselrot (Hb. Holm.).

Fig. 7. *Omphalia luteovitellina* Pilát & Nannf.
Carposomata (× 2) et sporae (ca. × 2000). — Alund (typus). — A. Pilát del.

Pileus 7—13 mm diam., e plano, margine deflexo et involuto, dein centro depressus, quoque statu maturo margine diu et manifeste involutus et paulo crenulatus, elasticus, pallide luteo-vitellinus, Iove sicco pallidior, glaber, siccus et laevis. — Lamellae laete vitellinae, humiliter triangulares, decurrentes, angustiores quam in *O. ericetorum,* brevioribus et angustioribus intermixtae, subcrassae, acie haud erosae, concolores. — Stipes cylindraceus, saepe paulo curvulatus, sed erectus, basi minime incrassatus, 15 × 1—2 mm, glaber laevisque, vitellinus, plerumque paulo obscurius quam pileus, elasticus et subfirmus, substrato tomento albo adnexus. — Basidia tetraspora, hyalina, 20—27 × 6—7,5 μ. — Sporae oblongo-ellipsoideae, basi oblique apiculatae, plerumque uniguttulatae, hyalinae, laeves, 7—9 × 3—4 μ. — Cystidia nulla. — Hyphae efibulatae, 2—4 μ crassae, hyalinae.

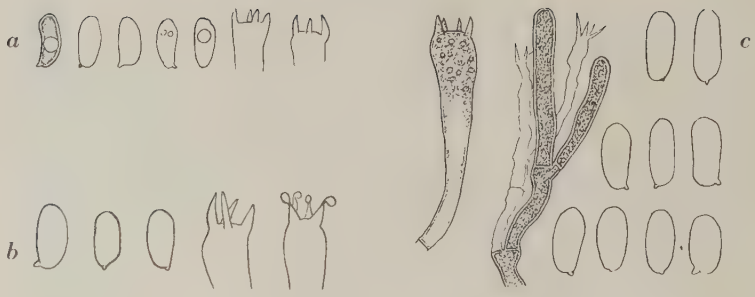

Fig. 8. *Omphalia luteovitellina* Pilát & Nannf.
Spores and basidia (ca. × 1000, the basidial cluster in c. only ca. × 700). — a. Lillskarven (Arwidsson & Haglund). Herbarium material soaked in ammonia and transferred to glycerine. — b. Ditto transferred to lactic blue. — c. Storsnasen (N. n. 11645). Lactic blue. — J. A. Nannfeldt del.

Species pulchra, *O. ericetorum* similis, sed colore laete vitellino, lamellis angustioribus, margine pilei diu involuto sporisque angustioribus discrepans [P.].

This diminutive but nevertheless very conspicuous species is probably common in the reg. alp. throughout the whole of the Scandes, though its fruit-bodies are very scattered in occurrence. Previously, it was not kept distinct from bright-coloured forms of *O. ericetorum*, except by Dr. G. Haglund, who recognized its identity with Möller's *O. flava*. Blytt's notice from Norway that var. *flava* is the form of *O. umbellifera* (= *O. ericetorum*) that ascends highest in the mountains (reaching 1600—1900 m s. m.) may in part refer to *O. luteovitellina*, although all specimens from the reg. alp. preserved in Hb. Oslo belong to *O. ericetorum*. The same applies to M. Lange's report (1946:166) from the Abisko region that *O. umbellifera* in the higher zones (from about 1000 m s. m. and upwards) is represented esp. by var. *flava*.

The first to distinguish our species sharply was F. H. Möller (l.c.), who gave a good description of it from the Faeröes as „*O. flava* (Cke pro var.) n. sp.". Unfortunately, this name is untenable nomenclaturally for the species intended, as Möller based his species expressly on Cooke's *Agaricus umbelliferus* var. *flavus* (Ill. Brit. F. tab. 271:3). This typification becomes absolutely inevitable by the fact that — in obedience to the „International Rules of Nomenclature" — Möller gave latin diagnoses to all his new species but not to this. Cooke's name is strictly spoken a *nomen nudum* being used

only on the plate and substituted in the accompanying text (Cooke 1883:96) by var. *abiegnus* B. & Br. These two names represent not our species but a relatively bright form of *O. ericetorum* from spruce stumps, which form has been regarded as a distinct species, *O. abiegna,* by several later authors. But even if *O. flava* (Cke) F. H. Möll. could be regarded as a *nomen nudum,* we think it safer to give a different name to our species.

Cantharellus dovrefjeldiensis P. Henn. & Kirschst. (l.c.) is a possible synonym, but we do not venture to identify it with our species, as its spores are described as ovoid and only 4—5 × 3—3,5 μ. The type specimen which was in the Berlin herbarium, is certainly lost. [P. & N.].

Omphalia viridimammata Pilát n. sp. — (Fig. 9—10).

Abisko, prope castra militaria, ad terram turfosam, in muscis humilibus, 21.VI.1948, P. & N. (n. 9091. Typus.). - Ibid., prope »Naturvetenskapliga stationen«, ad terram turfosam, in muscis humilibus, 22.VI.1948, P. & N. (n. 9092).

Fig. 9. *Omphalia viridimammata* Pilát.
Carposomata (ca. × 3/2) et sporae (ca. × 1500). — P. & N. n. 9091 (typus).
A. Pilát del.

Pileus 5—10(—15) mm diam., tenuiter membranaceo-carnosus, orbicularis, plane convexus, iuventute margine anguste involutus, mox planus, ad marginem convexus, cacumine umbilicato-depressus et in umbilico umbone mammiformi, sat magno et subacuto, ornatus,

hygrophanus vel subhygrophanus, udus obscure brunneo-viridis vel olivaceo-viridis (tinctu sordide aerugineo vel aerugineo-cyanulo), Iove sicco albide griseus tinctu viridi, ad marginem subdiaphanus et margine lamellis translucescentibus substriatus, haud viscidus, glaber, haud raro paulo rugosus et plerumque circulis 1—2 circum umbonem ornatus. — Lamellae angustae, griseo-viridulae, remotae, Iove sicco sordide viridi-cyanulae, decurrentes. — Stipes teres, cylindraceus, 15—20 × 1—1,5 mm, obscure brunneo-viridis, Iove sicco sordide viridi-cyanulus, laevis glaberque. — Basidia tetraspora, clavata, hyalina, 20—25 × 5,5—7 μ. — Sporae ovoideae, subpiriformes apiculo magno paulo obliquo instructae, hyalinae, laeves, plasma granulosa hyalina praeditae, 8,5—9,5 × 5,5 μ. — Cystidia nulla. — Hyphae fibulatae, 4—6 μ crassae, hyalinae.

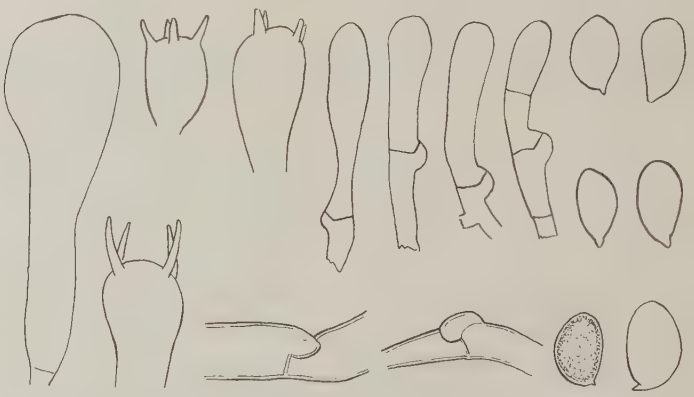

Fig. 10. *Omphalia viridimammata* Pilát.
Basidia in different stages of development, in part showing the clamp connections, parts of pileal hyphae showing clamp connections, and spores. (All ab. × 1200). — P. & N. n. 9091 (typus). Herbarium material soaked in ammonia and transferred to lactic blue. — J. A. Nannfeldt del.

Haec species praecipue colore sordide viridi et pileo umbilicato cum umbone notabilis est. A formis viridibus *O. ericetorum* praeter alia lamellis angustis et hyphis fibulatis discrepat.

Omphalia Lundellii Pilát n. sp. — (Fig. 11—12).

Species vere in regione abiskoensi valde copiosa et frequens, ad terram turfosam, udam, in muscis humilibus vel rarius in sphagnetis, in carbonariis locis turfosis etc.

Abisko, ad semitam in carbonario, loco turfoso, 19.VI.1948, P. & N. (n. 9094). — Ibid. 20.VI.1948, G. Sandberg. — Ibid., prope castra militaria, ad terram turfosam humidam in muscis humilibus vel ad terram denudatam, etiam in sphagnetis, 21.VI.1948, P. & N. (n. 9788. Typus.). Haec collectio in Lundell & Nannf., F. exs. suec., edetur. — Etiam in vicinitate locis pluribus similibus frequens.

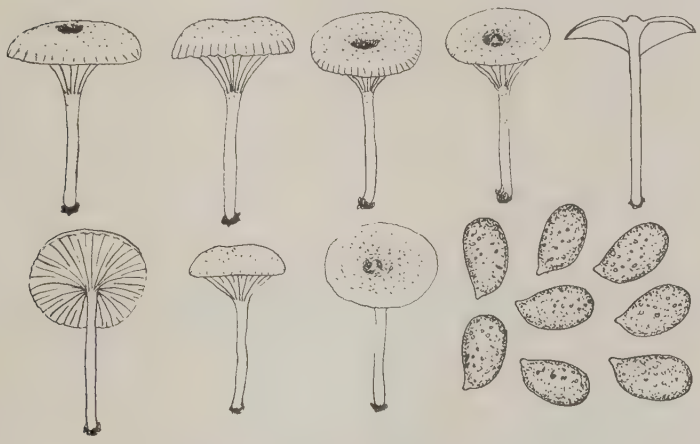

Fig. 11. *Omphalia Lundellii* Pilát.
Carposomata (ca. × 5/4) et sporae (ca. × 1400). — P. & N. n. 9788 (typus).
A. Pilát del.

Pileus 10—15 mm diam., tenuiter membranaceo-carnosus, primum convexus, dein apice subplanus et ad marginem convexus, centro umbilico distincto et sat profundo notatus, in umbilico umbone verruciformi, semigloboso saepe ornatus, dein usque subinfundibuliformis, hygrophanus, udus triste obscure umbrinus usque nigro-brunneus, Iove sicco pallide sordide brunneus, ad marginem paulo rugoso-striatus, margine saepe paulo crenulatus, tota superficie squamulis parvis, sed distinctis, subsquarrosis et remotis, cinereis usque nigris, dein saepe evanescentibus, ornatus. — Lamellae distantes, plerumque sat longe decurrentes, parte media latissimae, griseo-brunneae, pilei paulo pallidiores. — Stipes tenuis et subfirmus, solidus, dein saepe subcavus, 25—30 × 1— 1,5 mm, griseo-cinereo-brunneus usque obscure brunneus, pileo subconcolor, laevis glaberque, apice solum sub lamellarum insertione saepe paulo albide pruinoso-granulosus. — Basidia clavata, hyalina, tetraspora, 25— 30 × 6—9 μ. — Sporae hyalinae, ovoideo-subpiriformes, basi oblique distincte apicu-

latae, membrana laevi, hyalina, plasma subtiliter granulosa instructae, 7,5—9×4,5—5,3 μ. — Cystidia nulla. — Hyphae fibulatae, exteriores ad 8 μ crassae, membranis ± brunneis, incrustatis.

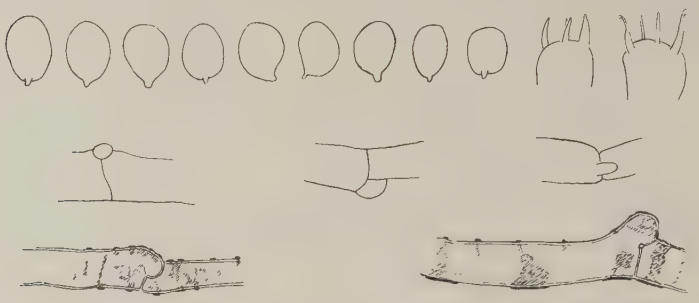

Fig. 12. *Omphalia Lundellii* Pilát.
Spores, basidia and pileal hyphae showing clamp connections, the two lowermost from the external layer with incrusted walls. (All ab. × 1000). — P. & N. n. 9788 (typus). Herbarium material soaked in ammonia and transferred to lactic blue. — J. A. Nannfeldt del.

Haec *Omphalia* parva sed conspicua certe species bona et autonoma est, quod etiam cl. Seth Lundell mihi testificavit.

Marasmius esculentus (Wulf. ex Fr.). — Syn.: *M. tenacellus* (Pers. ex Fr.) Schroet., s. str. sensu Favre. — Cfr. Lundell & Nannfeldt, F. exs. suec. n. 1723 (1949) (ut *Collybia esculenta)*.

Abisko, ca. 1 km ad austro-occid. a statione viae ferreae, e conis *Pini silvestris* sub terra latitis proveniens, 19.VI. 1948, P. & N. (n. 9086).

Sporae ellipsoideae, hyalinae, 6,5—8×2,8—3,5 μ. — Cystidia vesiculoso-clavata, 30—40×12—15 μ, in acie lateribusque lamellarum.

Pleurotus unguicularis (Fr.) Quél. — Cfr. Pilát, Atl. Champ. de l'Eur. 2:77, 1935.

In pede septentrionali montis Nuolja, infra viam ferream, ad rivum Kåppasjokk, e cortice rami emortui betulini erumpens, 18.VI.1948, P. & N. (n. 10565). Sporae cylindraceo-curvulae, 6—7,5 × 1,5—1,7 μ. — Abisko, prope »Naturvetenskapliga Stationen«, in ramo emortuo betulino, 16.VI. 1948, P. Basidia 10—15 × 3,5—5 μ. Sporae 5,6 7,5 × 1,2—1,7(-2) μ, cylindraceo-curvulae, hyalinae. Cystidia nulla.

Specimina lapponica cum medio-europaeis bene concordant sed dimensionibus sporarum sat *Pl. michailowskojensi* P. Henn. spectant. Probabiliter haec species formam microsporam *Pl. unguicularis* representat. Sporae *Pl. michailowskojensis* 3,8—5 × 1,5—1,8 μ et *Pl. unguicularis* 6,5—8(—11) × 3—3,5 μ sunt. Ergo specimina lapponica sporas paulo angustiores et minores habent quam *Pl. unguicularis* typica. Sed etiam in speciminibus lapponicis sporas magnitudine sat variabiles observavimus. *Pl. Silvanus* Sacc. quoque affinis est sed sporis parum curvatis 6—7(—8) × 3,5—4(—5) μ dignoscitur. Sec. Romagnesi (1945:38) *Pl. michailowskojensis* cum *Pano ringenti* Fr., i. e. *Pl. violaceo-fulvo* (Batsch ex Fr.) Pilát fa. *Delastrei* (Mont.) Pilát identica est.

Leptotaceae.

Leptotus lobatus (Pers. ex Fr.) Karst., Bidr. känned. Finl. nat. o. folk 32:243, 1879. — (Fig. 13).

Syn.: *Merulius lobatus* Pers., Syn. p. 494, 1801; Myc. Eur. 2:23, 1825. — *Cantharellus lobatus* Fr., Syst. Myc. 1:323, 1821; Epicr. p. 369, 1836; Monogr. 2:211, 1863; Hym. Eur. p. 461, 1874; Sacc., Syll. Fung. 5:497, 1887. — *Dictyolus lobatus* Quél., Ench. fung. p. 140, 1886; Fl. Mycol. p. 34, 1888; Favre, Mat. Fl. Crypt. Suisse 10:3:41, 1948. — *Leptoglossum lobatum* Ricken, Blätterp. p. 6, 1915; Velenovsky, Mykol. 2:45, 1925 — ? *Helvella membranacea* Dicks., Fasc. plant. cryptog. Brit. 1:21, 1785 (non Holm, Kgl. Danske Vid. Selsk. Skr., N.S. 1:286, 1781; Holmskj., Beata ruris otia 2:52, tab. 28, 1799, q.e. *L. retirugus*). — *Elvela membranacea* Vahl, Skr. Naturhist.-Selsk. 2:1:61, 1792; Fl. Dan. Vol. 6, Fasc. 18:8, tab. 1077:1, 1792. — *Merulius uliginosus* Pers., Myc. Eur. 2:22, 1825 („fungus siccus" teste Fries, Elench. 1:55, 1828). — ? *Cantharellus bryophilus* Peck ap. Sacc., Peck & Trelease in Harriman, Alaska Exped. 5:46, 1904.

Vassitjåkko, in palude, ad muscos majores *(Calliergon sarmentosum, Paludellam squarrosam* etc.), 15.VIII.1909, L. Romell (Hb. Romell n. 12189 ut *Cantharellus griseus)* — Björkliden, in palude, ad muscos majores *(Cratoneuron* sp. etc.), 9.VIII.1909, L. Romell (Hb. Romell n. 12188 ut *Cantharellus griseus)*. — Abisko, in palude calcarea, ad muscos majores *(Drepanocladum intermedium, Dr. revolventem, Cinclidium stygium* etc.), 20.VI.1948, G. Sandberg. — Ibid., prope »Naturvetenskapliga stationen«, in palude calcarea, ad muscos majores *(Drepanocladum exannulatum, Calliergon sarmentosum* etc.), 31.VIII.1946, L. Holm (n. 560). Editus ut *L. muscigenus* in Lundell & Nannf., F. exs. suec. sub n. 1775.

Carposomata 30—35 mm diam., orbiculari-flabelliformia, vel deorsum paulo cuneato-contracta et substipitata vel absque stipite lateraliter insidentia, haud raro paulo contorta, triste griseo-brunnea, tenuiter subgelatinosa, subpellucida, superficie perfecte glabra, sublucida et subtiliter gelatinoso-rugosa, margine elegantissime lobato-undulata. — Basis stipitiformis, parva, plerumque 1—3 mm longa, haud raro obsoleta, rarissime stipitiformiter elongata, subtomentosa. — Rugae lamelliformes undulatae, plerumque modo dichotomo ramosae, rarius ad marginem pilei paulo anastomosantes, humiles, pileo concolores, modice albide pruinosae. — Caro pilei tenuissima, aquose subgelatinosa, subbrunnea. — Basidia tetraspora, rarius bispora, 20—35 × 6—8 μ. — Sporae hyalinae, ovoideae, basi suboblique apiculatae, laeves, 8—10 × 5,5—6 μ. — Cystidia nulla. — Hyphae fibulatae. [P.].

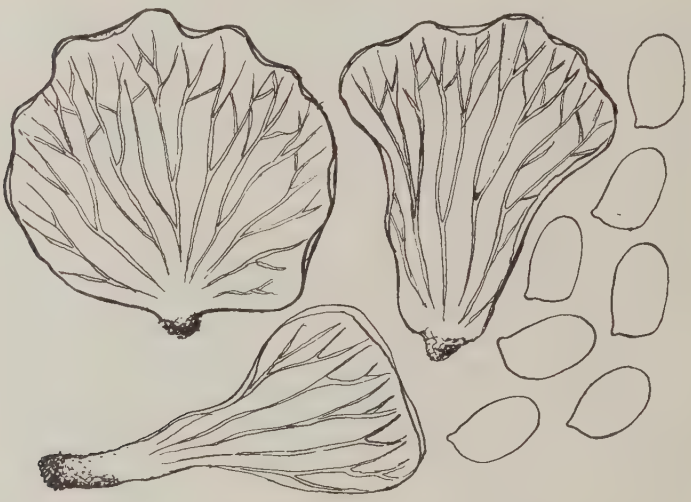

Fig. 13. *Leptotus lobatus* (Pers. ex Fr.) Karst.
Carposomata (ca. × $^5/_3$) et sporae (ca. × 1600). — Abisko, Sandberg.
A. Pilát del.

Although this species was described and illustrated recognizably more than a century and a half ago, it is little known and often misunderstood by recent authors. It is an inhabitant of very wet fens, growing on large mosses, esp. *Drepanocladus* spp., and its main fruiting time in the lowlands is early spring. Thus it is only natural

that it was more easily found by the all-round botanists of times past than by the specialized mycologists of to-day.

The first illustration, which is also a good one, is Vahl's in Flora Danica (l.c.) under the name of *Helvella membranacea* Dicks. Vahl (comp. also Vahl 1792: 61—62) had found it in two Norwegian localities, viz. scantily at Kvamsvollene in Lom parish (Opland fylke) and copiously at Vardö (Finnmark fylke). Whether the *Helvella membranacea* of Dickson (l.c.) is the same species is difficult to decide. The habitat given („in paludosis, verno tempore") does not contradict their identity but at the same time does not exclude *L. retirugus* (Bull. ex Fr.) Karst., which seems to possess a very wide ecological amplitude. The first *Helvella membranacea,* that of Holm (ennobled Holmskjold and better known under the latter name), which grows on *Eurhynchium* sp. *(praelongum* or *Swartzii)* is according to the excellent illustration (Holm 1781, fig. VII; Holmskjold 1799, tab. 28) *L. retirugus,* as suggested already by Schumacher (1803:370). Persoon placed Dickson's species into his genus *Merulius* and coined the name *M. lobatus* for it. Fries transferred Persoon's species to *Cantharellus* and cited both Vahl and Holmskjold. His descriptions indicate clearly Vahl's species. In 1828 Fries augmented the synonymy of *C. lobatus* with *Merulius uliginosus* Pers. described from Switzerland and from the description indubitably identical with Vahl's species. The still unpublished plate, cited in „Monogr." (l.c.) and drawn from specimens collected at Uppsala, also shows Vahl's species. Thus in spite of the confused early history of these fungi it is beyond doubt that the name of *Cantharellus lobatus* must be interpreted as aiming at Vahl's species.

This species, of which Favre (1948:41) gave a good description and a good photograph, resembles *L. muscigenus* (Pers. ex Fr.) Lundell but is easily distinguished from it by the lack of a stipe. In this point it agrees with *L. retirugus* but is separated from that species by the darker and much thicker fruitbodies. It has another ecology than *L. muscigenus,* which is an autumnal species inhabiting dry habitats, such as rocks, stone walls and sandy hills, with its fruitbodies usually attached to *Tortula ruralis.* The fruitbodies of *L. lobatus* may attain a larger size than those of *L. muscigenus,* and their hyphae are fibulate. The external hyphae of *L. lobatus* are darker, more strongly incrusted than those of *L. muscigenus.* It seems to have its main distribution in arctic and subarctic countries and in

the mountains although it is also found in the lowlands of Scandinavia and Central Europe.

Besides the Torne Lappmark specimens listed above I have seen only one Swedish specimen (Östergötland: Skedevi par., Reijmyra, in a wet fen close to Lake Mögsjögölen, on living *Drepanocladus fluitans,* 20.V.1868, H. von Post, Hb. Stockh.).

A. Blytt (1905:110) cites our species from two Norwegian mountain localities besides Vahl's Vardö locality. We have not seen the corresponding specimens but two specimens from the South of Norway were to be found in the Hb. Oslo (Akershus fylke: Ås, on living *Climacium dendroides,* VI. 1885, F. Werenskjold, and Opland fylke: Hadeland, Vesland, 5.IX.1914, J. Egeland).

It is furthermore known from Finland (Karsten e.g. 1889:274), Iceland (Larsen 1932:519) and Great Britain (e.g. Cooke 1883: 343). In the arctic region it seems to be common, being known of old from Spitsbergen (Karsten 1872:94), Beeren Eiland (l.c.) and (West- and East-) Greenland (e.g. Rostrup 1888:530; 1891:598; 1894:8). I have seen an East-Greenlandish specimen from so northern a locality as Mackenzie Bay, Myggebugt (73° 28' N.) (19.VIII.1933, A. Hagen, Hb. Oslo). Most interesting phytogeographically is a specimen from Franz Josef Land (= Fridtjof Nansen Land) (Prince George Island, Cape Nansen, 80° 31' N., 17.VIII.1930, Olof Hanssen, Hb. Oslo), which shows it to be a member of the very poor flora of that archipelago, whose flowering plants number only 36 species (Hanssen & Lid 1932).

It seems probable that the Alaska fungus described as *Cantharellus bryophilus* Peck also belongs here. Murrill (1912:206) identifies it with *L. retirugus* but the description indicates rather *L. lobatus.* The *Dictyolus muscigenus* reported by Polunin (1934:202) from Akpatok Island in Hudson Strait and by Linder (1947:277) from Baffin Land seems to be our species as well.

L. lobatus is known of old from the Alps and is probably not too rare there (cfr. e.g. Favre 1948:41—42). Pilát informs me that it is not rare in Bohemia and that it fruits there in autumn, winter and spring.

There are very few records of it from the Central-European lowlands. Several specimens from Germany have, however, been studied and all these were collected in early spring. Such specimens from near Berlin have been distributed in Sydow, Myc. march. n. 314 *(Cantharellus muscigenus),* 2318 *(C. lobatus),* 3501 *(C. lobatus),* in

Sydow, Myc. germ. n. 1419 *(Leptotus lobatus)*, and in Rabenhorst, F. eur. n. 2731 *(C. muscigenus)*. It is moreover distributed from Baden in Krypt. Badens n. 657 *(C. muscigenus)*. [N.].

Arrhenia Auriscalpium (Fr.) Fr., Summa Veg. Scand. p. 312, 1849; Hym. Eur. p. 462, 1874; Sacc., Syll. Fung. 5:499, 1887. — (Fig. 14.).

Syn.: *Cantharellus Auriscalpium* Fr., Elench. fung. 1:54, 1828; Epicr. p. 368, 1836; Monogr. Hym. 2:210, 1863. — *Cantharellus buxbaumiaeformis* Wallr., Fl. Crypt. Germ. 2:626, 1833. — *C. Mühlenbeckii* Trog, Flora 22[:2]:437, 1839.

Abisko, in semita humosa in muscis humilibus, in betuleto juxta »Naturvetenskapliga stationen«, 21.VI.1948, N. (n. 9093).

Etiam carposomata dua e parte meridionali montium suecicorum a Nannfeldt examinata sunt: Herjedalia, par. Storsjö, ad »Gamla Nedalsstugan«, 848 m s. m., in turfa sicca, 28.VIII.1950, H. Smith (Hb. Ups.).

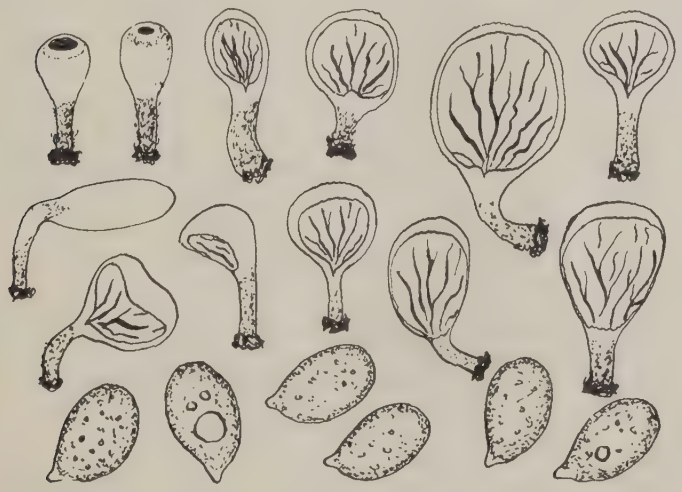

Fig. 14. *Arrhenia Auriscalpium* (Fr.) Fr.
Carposomata in diversis stadiis evolutionis (ca. × 2) et sporae (ca. × 2000). — N. n. 9093. — A. Pilát del.

Carposomata iuvenilia regulariter cupulaeformia, erecta, subfusca vel fusca, uda subdiaphana, ca. 5—10 mm alta, dein unum dimidium cupulae modo asymmetrico crescens et e basi quidem laterali adscendens pileum subhorizontalem conformat; adulta *Hydnum Auri-*

scalpium habitu paulo in mentem revocant, sed multo minora et tenuiora. — Pileus horizontalis vel subhorizontalis, convexus, subconchiformis, obovatus vel subspathulatus, margine undique arcuato-reflexus (unde supra convexus et infra concavus), ca. 10 mm latus, tenuis, solum 0,25—0,4 mm crassus, superficie minime albido-puberulus usque subglaber, nec villosus, neque striatus, sed haud raro paulo rugulosus, griseo-nigrofuscus, siccus subconvolutus, nigrescens. — Stipes lateralis, pileo ± rectangulariter insidens, cupulam obversam referens, erectus, teres, aequalis, ca. 5 mm longus et ca. 2 mm crassus, sursum saltim in sicco albido-pruinosus, inferne tomento tenui, albido obductus et basi effusae insidens. — Plicae humiles, 3—7, distinctae, prominentes, longitudine inaequales, saepe undulatae, a stipite margine tenui pilei discretae (residuum cupulae primordialis), parce ramosae modo dichotomico et parce anastomosantes. — Basidia tetraspora, 12—28 × 4,5—6,5 μ. — Sporae ovoideo-piriformes, basi apiculo sat magno praeditae, 8—9,3 × 5,5—6 μ, hyalinae, laeves, plasma granulosa usque una gutta oleosa instructae. — Cystidia nulla.

Species rarissima boreali-alpina, adhuc male nota sed vero admirabilis et maxime characteristica, ad terram nudam vel muscis humilibus obtectam, praecipue ad vias silvaticas etc. crescit. Fries hanc speciem ad terram nudam, humosam, declivem in fageto unico loco in Femsjö Smolandiae pluries Oct.—Nov. legit.

Cantharellus buxbaumiaeformis Wallr. (l.c.), ut iam cel. Fries commemorat, identicus est. Diagnosis Wallrothii:

»Ascomatibus pusillis tenuissime membranaceis pellucidis pallidis, siccando dilute fuscescentibus, e basi stipitiformi gracili tereti laevi in pileum dimidiatum flabelliformem glaberrimum sensim dilatatis, subtus plicis paucissimis subsimplicibus striaeformibus parce inscriptis.

Ad vias in terra arenosa agri hering. rarissime. Auct[umno].«

Etiam *Cantharellus Mühlenbeckii* Trog (l.c.) teste Fries identicus est. Diagnosis originalis huius speciei:

»Stipitatus, cochleatus; pileo membranaceo convexo nigrescente, venis prominulis inaequalibus radiantibus; stipite laterali tereti nigro.

Der 2 Linien lange Strunk ist stielrund, schwarz, etwas filzig, wagerecht. Der häutige, 3 Linien breite Hut ist seitenständig, gewölbt, fast durchscheinend, schwärzlich; die etwas erhabenen Adern sind ungleich, strahlenförmig, grau. — Dieser niedlich kleine Aderschwamm wurde von meinem verehrten Freunde und eifrigen Mykologen, dem Hrn. Dr. Mühlenbeck am 5. Juli 1838 zwischen *Meesia alpina* auf dem Gipfel des Faulhornes [2684 m s. m.] gefunden und mir gütigst mitgetheilt.«

A. Auriscalpium from a phylogenetic point of view is a most interesting species since it indicates one of the evolutionary lines from *Cy-*

phellaceae to *Agaricineae*. Our drawing demonstrates the ontogeny of its receptacles. The young receptacles are typical goblets, as we find them in the genus *Cyphella*. By one-sided prolongation of the goblet a cap with primitive lamellae is formed, adfixed laterally to the stipe. From this initial stage we can easily imagine the evolution of types with a central cap: the cap enlarges laterally, turns over in bag-shape, the margins finally meeting and growing together. Thus we should obtain a receptacle rather reminiscent of e.g. *Clitocybe umbonata* (P e r s. ex F r.) or *Cl. cyathiformis* (B u l l. ex F r.), which form the transition to more typical species of *Clitocybe*. This road would thus lead from *Cyphella* via cantharelloid species to *Clitocybe*. Also the pearshaped spores with relatively large apiculi, which we find in most of these species, suggest that they may be related.

Another evolution or line from the *Cyphellaceae* can be followed via *Porothelium* and *Solenia* to *Poria*. Thus the *Polyporaceae* with hyaline spores and trama and with coloured trama can be derived.

Arrhenia Auriscalpium represents the type species of the genus *Arrhenia* F r. It is extremely uncertain whether the other species placed by F r i e s and especially by later authors belong in the same genus. In most cases I think it is most questionable. *Arrhenia Auriscalpium* has completely hyaline spores — at any rate under the microscope, for owing to the minuteness of the receptacles and the small amount of spores I cannot judge the colour of the spore-print [P.].

CYPHELLACEAE.

Genus *Solenia* (sub *Polyporaceis*) a cl. L. R o m e l l (1911:21) tractata est.

Cyphella filicina KARST. (det. S. LUNDELL).

Snuoratjåkko, in declivitate meridionali lacum Torneträsk versus, reg. subalp., in petiolis anni praeteriti *Matteucciae Struthiopteridis*, 16.VII.1928, N. (n. 1879).

Solenia anomala (PERS. ex FR.) FUCK.

Syn.: *Cyphellopsis anomala* (P e r s. ex F r.) D o n k.

R o m e l l 1911:31. — In regione abiskoensi valde frequens, praecipue in *Salicibus* sed etiam in *Betula* et rarius in *Populo tremula*. Specimina

nonnulla legimus, e.g. Abisko cum vicinitate, N. (n. 1029, 1397, 1414, 1433, 1551) et P. & N. (n. 9682, 9683, 9832, 9836); Nuolja, P. & N. (n. 9686, 9833, 9834, 9835, 9837); Låktatjåkko, N. (n. 1598); Snuoratjåkko, N. (n. 1227).

Solenia candida Pers. ex Fr. (det. J. Eriksson).
Björkliden. 1.IX.1909, L. Romell (Hb. Romell n. 12145).

[**Solenia villosa.** — Romell 1911:31 — Verosimiliter lapsus calami pro *S. candida,* cum cui descriptio romelliana congruit. Nulla specimina in herbario suo *S. villosam* nominata vidimus].

LITERATURE

Blytt, A. (1905): Norges Hymenomyceter. — Vidensk.-Selsk. Skr. I. Math.-naturv. Kl. 1904 No. 6. — Christiania.

Cooke, M. C. (1883): Handbook of British Fungi... Second and revised edition. — London.

Favre, J. (1948): Les associations fongiques des hauts-marais jurassiens et de quelques régions voisines. — Beitr. z. Kryptogamenflora der Schweiz 10:3. — Bern.

Fries, Rob. E. (1910): Några ord om myxomycetfloran i Torne Lappmark. — Sv. Bot. Tidskr. 4: 253—262. — Stockholm.

Fries, Th. C. E. (1914): Zur Kenntnis der Gasteromycetenflora in Torne Lappmark. — Sv. Bot. Tidskr. 8:235—245. — Stockholm.

— (1918): Några anmärkningsvärda Gasteromycet-fynd. — Ibid. 12: 130—131. — Stockholm.

— (1921): Sveriges gasteromyceter. — Ark. f. Bot. 14:9. — Uppsala.

Gäumann, E. (1918): Ein Beitrag zur Kenntnis der lappländischen Saprolegnieen. — Bot. Not. 1918:151—159. — Lund.

Hanssen, O., & Lid, J. (1932): Flowering Plants of Franz Josef Land. — Skr. om Svalbard og Ishavet 39. — Oslo.

Henning, E. (1885): Bidrag till svampfloran i Norges sydligare fjelltrakter. — Öfvers. K. Vet.-Akad. Förh. 1885:5:49—75. — Stockholm.

— (1887): Växtfysiognomiska anteckningar från västra Härjedalen med särskild hänsyn till hymenomyceternas förekomst inom olika växtformationer. — Bih. K. Sv. Vet.-Akad. Handl. 13:III:1: — Stockholm.

Hertz, St. (1947): Geaster minimus funnen i Lappland. — Sv. Bot. Tidskr. 41:486—487. — Uppsala.

Holm, Th. (1781): Afhandling om nogle Kryptogamer, som deels voxe paa visse Deele af andre Vexter, deels fremkomme af Dyre-Riget... — N. Saml. af d. Kgl. Danske Vidensk. Selsk. Skrifter 1:279—302. — Kiøbenhavn.

Holmskjold, Th. (1799): Beata ruris otia fungis danicis impensa. 2. — Kiøbenhavn.

Ingelström, E. (1940): Svampflora. — Stockholm.

Juel, H. O. (1912): Beiträge zur Kenntnis der Gattungen Taphrina und Exobasidium. — Sv. Bot. Tidskr. 6:353—372. — Stockholm.

Karsten, P. A. (1872): Fungi in insulis Spetsbergen et Beeren Eiland collecti. — Öfvers. K. Vet.-Akad. Förh. 1872:2:91—108. — Stockholm.

— (1889): Kritisk öfversikt af Finlands basidsvampar. — Bidr. känned. Finl. natur o. folk. 48. — Helsingfors.

Laestadius, C. P. (1860): Bidrag till kännedomen om växtligheten i Torneå Lappmark. — Uppsala. (Diss.)

Lange, M. (1946): Mykologiske Indtryk fra Lappland. — Friesia 3:161—170. — København.

Larsen, P. (1932): Fungi of Iceland. — Botany of Iceland 2:3. — København.

Lind, J. (1934): Studies on the Geographical Distribution of Arctic Circumpolar Micromycetes. — Kgl. Danske Vidensk. Selsk. Biol. Meddel. 11:2. — København .

Linder, D. H. (1947): Fungi in **Polunin, N.**, Botany of Canadian Eastern Arctic. Part II, Thallophyta and Bryophyta. — Nat. Mus. of Can. Bull. 97:234—297.

Litschauer, V. (1941a): Neue schwedische Corticieen aus dem Herbar L. Romell's — Ann. Myc. 38:117—135. — Berlin.

— (1941b): Über einige Tomentella-Arten aus Schweden und Macedonien. — Ibid.: 360—378. — Berlin.

— (1944): Beitrag zur Kenntnis der Gattung Aleurodiscus (mit besonderer Berücksichtigung schwedischer Arten). — Ibid. 42: 1—23. — Berlin.

Lundell, S., & Nannfeldt, J. A. (1934—): Fungi exsiccati suecici, praesertim upsalienses 1 — . — Uppsala.

Murrill, W. A. (1912): The Agaricaceae of the Pacific Coast. 1. — Mycol. 4:205—217. — Lancaster, Pa.

Möller, F. H. (1945): Fungi of the Faeröes. 1. — København.

Nannfeldt, J. A. (1928): Contributions to the Mycoflora of Sweden 1. Discomycetes from Torne Lappmark. — Sv. Bot. Tidskr. 22:115—139. — Uppsala.

Neuhoff, W. (1936): Die Gallertpilze Schwedens. (Tremellaceae, Dacrymycetaceae, Tulasnellaceae, Auriculariaceae.) — Ark. f. Bot. 28A:1. — Uppsala.

Palm, Bj. (1917): Svenska Taphrinaarter. — Ibid. 15:4. — Uppsala.

Pilát, A. (1935): Pleurotus Fries. — Atl. d. Champ. de l'Eur. 2. — Praha.

— (1946): Monographie des espèces européennes du genre Lentinus Fr. — Ibid. 5. — Praha.

Polunin, N. (1934): The Flora of Akpatok Island, Hudson Strait. — Journ. of Bot. 72:197—204.

Romagnesi, H. (1945): Étude de la structure de la trame chez quelques Pleurotacées. — Bull. Soc. Myc. Fr. 61:38—46. — Paris.

Romell, L. (1911): Hymenomycetes of Lappland. — Ark. f. Bot. 11:3. — Uppsala.

Rostrup, E.: Fungi Groenlandiae. Oversigt over Grønlands Svampe. — Meddel. om Grønland 3:515—590. — Kjøbenhavn.

— (1891): Tillæg til „Grønlands Svampe (1888)". — Ibid. 3:591—643. — Kjøbenhavn.

— (1894): Øst-Grønlands Svampe. — Ibid. 18:1—39. — Kjøbenhavn.

Rytz, W. (1927): Einige Beobachtungen an Uredineen, gesammelt an der 4. I. P. E. — Veröff. des Geobot. Inst. Rübel in Zürich 4:78—95. — Bern.

Sandberg, G. (1940): Gasteromycetstudier. — Acta Phytogeogr. Suec. 13: 73—95. — Uppsala.

Schäffer, J. (1939): Revision der Russula-Sammlung Romells... — Ark. f. Bot. 29A:15. — Uppsala.

Schumacher, Chr. Fr. (1803): Enumeratio plantarum in partibus Saellandiae septentrionalis et orientalis. 2. — Hafniae.

Vahl, M. (1792): Nogle Iagttagelser ved en Reise giennem Norge til dets nordlige Dele. — Skr. Naturhistorie-Selsk. 2:1:1—71. — Kiøbenhavn.

Prague, Národní Museum, and Uppsala, Botaniska Museet,
December 1951.

CLITOCYBE CONNATA (Schum. ex Fr.) I NORGE

Av JENS STORDAL

Som nevnt et annet sted i „Friesia" (Bd. IV, s. 282) har jeg funnet *Clitocybe connata* i Våle i Vestfold. Under gjennomgåelsen av skivesoppherbariet ved Videnskapselskapets Botaniske Museum i Trondheim ble funnet en prøve av denne arten samlet og bestemt av professor O. A. Høeg fra Trondheim 25.8.1936. Prøven består av et knippe på 3—4 fruktlegemer med kort fot. Sporer 6—7×3,5 μ. Dette skulle være det første sikre funn i Norge. Professor Høeg har forøvrig en del notater om den fra Trøndelag og sier i sine „Notater over sopper i Trøndelag og Nordmøre" i „Våre Nyttevekster" for 1943: „*Clitocybe connata* (og nærstående former), knippetraktsopp, temmelig vanlig i hageveger og i skog i og omkring Trondheim, og også notert fra endel andre steder."

I en liste over torvført sopp i Oslo nevner Chr. Fr. Bøhme (1938) denne arten *(Cl. connata* og *Cl. opaca)* fra 1936 og 1937. *Cl. connata* (Schum. ex Fr.) og *Cl. opaca* (Sow. ex Fr.) er ganske sikkert synonymer, men om det er tydelig skilt mellom denne og nærstående arter under slik matsopp-kontroll er uvisst. Senere har Bøhme angitt den fra flere lokaliteter i en liste som ligger oppbevart på Statens Plantevern i Oslo.

På Vestlandet er den bare kjent fra Voss i Hordaland der jeg fant den sist høst.

Cl. opaca var utstilt ved en sopputstilling i Levanger i 1936 arrangert av fru Louise Heimbeck. Finnestedet er ikke sikkert angitt, men det var antagelig i et av herredene Leksvik, Mosvik, Malvik, Skogn eller Frol.

Opplysninger om lokalitetene er bare angitt for noen få. Høeg's prøve fra Trondheim ble funnet på gårdsplass blandt busker av

Sambucus racemosa, i Våle på veikant der det vokste løvtrær og på Voss blandt *Urtica dioica* på avfallsplass.

De to prøvene fra Voss avviker litt i utseende. Den ene (7118) var helt hvit, med regelmessig hatt og mere nedløpende skiver enn den andre (7149) som også var litt mere grå og uregelmessig. Lukten var svak hos begge og jeg tror begge prøver hører til samme arten. Fil. lic. Olof Andersson i Lund har sett begge og bekrefter mine bestemmelser.

Under trykkingen er tilføyet 5 lokaliteter fra 1954.

Cl. connata skulle da være kjent fra følgende lokaliteter i Norge:

Akershus

Oppegård: Kolbotten, nedenfor idretsplassen. 14.9.1944 (Bøhme).

Eidsvoll: SØ. for Eidsvoll st. 3.9.1942 (Bøhme); Bårliåsen. 25.9.1943 (Bøhme).

Oslo

Gollia st. mot Østmarka. 1.9.1940 (Bøhme).

Oppland

Jevnaker. 16.8.1940 (Bøhme).

Vestfold

Våle: Snekkestad. 6.10.1944 (J. Stordal).

Horten: Ø. Keisemark mot Borrevannet. 29.9.1942 (Bøhme).

Nøtterøy: Stangeby SV. for husmorskolen. 25.9.1942 (Bøhme).

Telemark

Notodden: Tinnesåsen. 24.9.1945 (Bøhme).

Hordaland

Voss: Vossevangen ved Vangsvannet. 7.10.1951 og 10.10.1951 (J. Stordal n. 7118, 7149). Materialet på Bot. Museum i Bergen. Fig. 1.

Os: Hatvik. 5.10.1954 (Tilsendt fra L. J. Lavik).

Fig. 1. *Clitocybe connata* (Schum. ex Fr.).
(Tørket herbariemateriale). Coll. J. Stordal nr. 7149. × ¾.

Sør-Trøndelag

Meldal: Løkke-Bjørnli (oppgitt som „knippetraktsopp") (Sandvik).

Trondheim: Tidemannsgt. 38. 25.8.1936 (O. A. Høeg). Materialet på Bot. Museum i Trondheim; Øya ved Angellske stiftelsers tomt. 22.8.1940 (Dr. Stendahl); Theissendammen og Elsterparken (O. A. Høeg); Bymarka 1941. (?) (O. A. Høeg).

Strinda: Rotvoll. 8.9.1938 (Det. O. A. Høeg).

Tydal: 1942 (E. Archer).

Troms

Balsfjord: Nordkjosbotn. 26.8.1954 (J. Stordal).

Ullsfjord: Brevikeidet. 29.8.1954 (J. Stordal).

Tromsöysund: Tromsöya. 24.8.1954 (J. Stordal).

Nordreisa: Storslett. 5.9.1954 (O. Skifte og J. Stordal).

ENGLISH SUMMARY

Clitocybe connata (Schum. ex Fr.) in Norway

The author presents a list of the localities of *Clitocybe connata* (Schum. ex Fr.) known in Norway. The material from Tidemansgt. in Trondheim collected on the 25th August 1936 is the first certain Norwegian find. The two specimens from Voss belong to the Botanical Museum, University of Bergen. The other finds are chiefly made by O. A. Høeg, Chr. Fr. Bøhme and the author.

LITTERATUR

Bøhme, Chr. Fr. (1938): Oslo Helseråds kontroll av torvført sopp gjennom 6 år. — Nytt Mag. for Naturv. 78: 106. Oslo.

Høeg, O. A. (1943): Notater om sopper i Trøndelag og Nordmøre. — Våre Nyttevekster, nr. 2. Oslo.

Stordal, J. (1953): Notater om storsopp i Våle, Vestfold. — Friesia 4: 267—295.

Vellykket sopputstilling i Levanger. — Våre Nyttevekster, nr. 9. 1936. Oslo.

Voss, Norge, april 1952.

MYCOFLORISTISKE INDTRYK FRA ROLD SKOV 1897 (SEPT. 10.—15.)

Af JAKOB E. LANGE

Redaktionen har med Glæde fra Dr. phil. Morten Lange, København, modtaget en Afskrift af et af hans Fader, den kendte Mykolog Jakob E. Lange affattet Manuskript, der indeholder en af de ældste danske mykofloristiske Beskrivelser. Dr. Lange har omhyggelig gennemgaaet Manuskriptet og, saa vidt det har været muligt, identificeret de „tvivlsomme" Svampearter. Hans Kommentarer følger efter Beskrivelsen.

Redaktionen.

From Dr. phil Morten Lange, Copenhagen, the editors have received for publication a copy of an interesting manuscript written by his father, the famous mycologist Jakob E. Lange, and containing one of the oldest Danish mycofloristic descriptions. About 160 species, mainly Agarics, are listed, all of them being collected during a trip to the large woods of Rold Skov, Jutland, in September 1897. Sixteen species in „Flora Agaricina Danica" are painted after specimens collected on this trip.

The editors.

I sept [18]97 havde jeg lejlighed til at gennemstrejfe det store skovområde, der — omtrent midtvejs mellem Hobro og Ålborg — øst for Lindenborg å breder sig fra Buderupholm i NV. til Madum sø i SØ. og Rold i SV., og som jeg i det følgende kortelig vil betegne som Rold skov.

Det er ikke alene en overmåde smuk, men tillige en i botanisk henseende overordentlig interessant egn. Skovene, der tilsammen siges at udgøre Danmarks største skovparti ($1^1/_3$ kvadratmil), frembyder ejendommelige forskelligheder. Ikke alene er der en rig afveksling af løvskov (væsentlig bøg) og nåleskov (såvel gammel granskov som unge plantager); men det stærkt couperede terrain giver skoven en yderst forskelligartet karakter, og på mange steder kan man iagttage de smukke overgange fra højbøgeskov til purrekrat og ren lyngbakkehede, fra granskov til lyngmose o. s. fr. En stor del af heden er opdyrket — skovstrækningen indeslutter flere landsbyer — navnlig mod vest findes prægtige lyngbakker (Rebild bakker), og mod øst store hedestrækninger med isprængt purr. Purrekrattet består næsten udelukkende af bøg og en del bævreasp; eg synes næsten ikke at forekomme. Derimod ses talrige enebær, der navnlig på bakkeskråningerne ofte vokser som „fodposer" om små purrebuske af bøg. — Overgangen mellem purrekrattet og højbøgeskoven dannes ofte af kæmpemæssige, gamle bøgebuske, (vel ca. 10 m høje) uden egentlig stamme, men med talrige stammelignende, knudrede og besynderlig vredne hovedgrene, under hvilke man trænger sig frem mellem affaldne og endnu fastsiddende, døde og undertrykte sidegrene.

Den temmelig snævre Lindenborg-ådal, i hvilken Buderupholm ligger malerisk omgivet af skov og krat, er meget lav (den næsten tilgroede Gravlev sø er kun 7 m over havet); men fra den hæver brede og ofte stejle skovskråninger og lyngbakker sig til en betydelig højde (100—114 m) med vid udsigt navnlig mod nord og vest. I højdedragets lavninger findes flere søer. Mos sø og Store Økssø omtr. midt i skovdraget er kun små, navnlig førstnævnte, og tildels tørvegroede, men Madum sø, hvis vestlige bred danner skovens grænse, er ret betydelig, godt 2 km lang, med temmelig flade, sandede bredder og klart vand.

Skoven gør mange steder et noget forblæst og fortørret indtryk med måragtig skovbund. Den er fattig på bregner, og selv i den tættere nåleskov er jorden ikke dækket af det tætte, bløde mostæppe, som f. eks. i Grib skov og ved Frederiksdal. Det er en udpræget jydsk skov.

Svampefloraen i denne egn var meget rig, om end måske knap så

overflødig som den samtidig udfoldede sig i skovstrækninger af lignende omfang på Sjælland. (Nogle dage før havde jeg gennemstrejfet Grib skov; jeg fandt der på en timestid lige så mange agaricineer som på en dagelang exkursion i Rold skov). For så vidt dette er et konstant forhold, kunne det måske tildels forklares ved nattefrostens tidligere indtræden i disse egne (allerede først i sept. var i de åbne lavninger plantevæksten om morgenen stivfrossen og rimklædt) og ved vindens stærkere udtørrende virkning på skovbunden. (Skønt det umiddelbart før mit besøg havde været vedholdende regnvejr, var skovbundens løvlag tem. tørt og adskillige svampe noget fortørrede). Hermed hænger muligvis også sammen den påfaldende, næsten fuldstændige mangel på arter af slægten *Mycena* (og andre småsvampeslægter), der f. eks. her på Fyn synes at være den aller talrigst repræsenterede agaricine-slægt, både hvad arts- og individ-antal angår. De såre fåtallige eksemplarer, der fandtes i Rold skov, var indskrænkede til de tætteste og fugtigste tykninger i granskoven og enkelte lyngmosedrag.

Heden er næsten svampløs*). Bortset fra enkelte gødningssvampe *(Chalymotta* [*Panaeolus*] *campanulata, Anellaria separata, Stropharia semiglobata),* af hvilke man hist og her støder på nogle eksemplarer, indskrænker floraen sig til nogle små „støvbolde" og i nærheden af boliger undtagelsesvis nogle spredte eksemplarer af „champignon" *(Psal. arvensis).* Kun hvor man nærmede sig til plantager eller purrekrat, blev den noget rigere på arter. Her voksede som karakterplante *Boletus scaber,* men endvidere fandtes småexemplarer af *Russula emetica* og enkelte *Cortinarii,* særlig *Myxacium collinitum,* der måske nærmest er at betragte som en fra skoven udvandret nybygger (eller urindvåner fra skovtiden?). Også *Cantharellus cibarius* optrådte på sådanne steder ret frodig, undertiden indtil 500 m fra skoven; den synes i det hele taget at foretrække mårbund.

Hvor heden er opdyrket, er floraen en anden, om end ikke stort rigere. Den magre, tørre jord afgiver intet rigt felt for svampenes udvikling. Dog er de i disse egne så almindelige langvarige græslæg noget gunstigere for visse svampes forekomst end de to-treårige græsmarker, der bruges på øerne. Bortset fra gødningssvampene synes næsten ingen agaricineer at komme til udvikling på græsmarkerne, før disse er mindst 4 år gamle, hvad der kunne tyde på en lang

*) Ved svampe forstås her agaricineer og lign. større svampe.

udvikling af myceliet. (Medens således gamle haveplæner ofte huser talrige svampe: *Coprinus plicatilis, Psilocybe foenisecii, Naucoria pediades* o. s. v., er unge græsplæner i regelen næsten svampeløse). — På sådanne gamle græsmarker fandtes da også en ret talrig bevoksning af navnlig småsvampearter, især dog ved vejkanter o. l., måske på grund af den tilførsel af gødningsstoffer, der her ved vejafskrab og støv bliver dem til del. Karakteristiske for disse lokaliteter var *Entoloma sericella* Fr., *Panaeolus semilanceatus* Fr., *Coprinus plicatilis* Curt. og andre småsvampe.

Hvor græsmarken går over i højeng-skråninger og overdrev, kommer dertil arter som *Hygrocybe conica* Scop. og *nitrata* Pers. og *Camarophyllus pratensis* Pers. og *virgineus* Wulf. Derimod var den fugtige græseng her som andetsteds fattig på svampe.

Hvor heden går over i lyngmose, forandrer floraen sig kendelig. Vel er den ikke stort rigere, men arterne er ganske andre. Særlig karakteristiske, navnlig ved tørvehuller og på tidligere afsveden hedemose — var *Psilocybe uda* Pers. og *Naucoria cerodes* Fr., men desforuden fandtes i de våde mospuder hist og her *Galera hypnorum* Batsch og endogså *Hygrocybe miniata* Fr. (der ellers særlig holder til i unge granplantninger på åbne bakker). Hvor mosen nærmede sig granskovens rand, fandtes mellem de høje lyngtuer ofte store mængder af Lactarier: den ved granskov allestedsnærværende *L. deliciosus* L. og navnlig hyppig den af F r i e s omtalte vandmælkede moseform af *L. helvus.* Men desuden fandtes enkelte *Psathyra*-arter og brune former af den form- og stedrige *Laccaria laccata* Sc., enkelte *Omphalier* o. s. v.

Den ellers så udprægede forskel mellem løv- og nåleskovens svampeflora syntes mig her mindre fremtrædende. Noget bidrog hertil den ovenfor omtalte mangel på *Mycena*-arter, hvoraf adskillige (f. eks. *M. pura)* her på Fyn er karakteristiske løvskovsbeboere. Men desuden var det mig påfaldende at træffe mange af de svampearter, der her på Fyn særlig optræder i løvskov, derovre voksede lige så vel i granskoven. Foruden de svampearter, der vokser direkte på bøgestammer, -grene og -pinde *(Polyporus fomentarius* L., *Lentinus cochleatus* Pers., *Marasmius alliaceus* Jacq., *Armillaria mucida* Schrad., *Leptonia placida* Fr. o. s. fr.) var de for bøgeskoven udelukkende karakteristiske arter særlig visse *Lactarier* og *Russula*-arter *(L. vellereus* Fr., *pargamenus* Sw., *pallidus* Pers., *R. adusta* Pers., *furcata* Pers.) samt *Amanita pantherina* DC og *phalloides* Vail. *(virescens), Tricholoma virgatum* Fr., *Pholiota (Rozites) caperata* Pers., *Ento-*

loma rhodopolium Fr., *Cortinarius (Dermocybe) cinnabarinus* Fr., *Limacium penarium* Fr. og *L. eburneum* Bull.

Rigest på arter og individer var absolut granskoven. Her optrådte foruden talrige arter, der ellers lige så vel eller fortrinsvis vokser i løvskov (*Amanita mappa* Fr., *Armillaria mellea* Fl.D., *Collybia radicata* Relh., *C. butyracea* Bull., *Lactarius subdulcis* Bull., *L. mitissimus* Fr., *L. blennius* Fr., *Russula fellea* Fr., *R. nigricans* Bull., *Boletus edulis* L. o. s. v.) en overmåde stor mængde typiske granskovssvampe. I den skyggefulde, ældre granskov dominerede særlig *Cortinarius (Inoloma) traganus* Fr., der på sine steder voksede i store flokke, der tog sig prægtig ud ved deres rene lysviolette farve; endvidere optrådte almindelig *Amanita porphyria* Fr., *Tricholoma rutilans* Schaeff. (på stubbe), *Cortinarius (Myxacium) collinitus* Sow. i talrige former (der måske indeslutter flere arter) og *Paxillus atrotomentosus* Batsch. Men rigest var mangfoldigheden i den lysere, unge granplantage, hvor der mellem mosset voksede pragtfulde klynger af højrød fluesvamp, store bevoksninger af *Cortinarius (Dermocybe) cinnamomeus* L. med dens talrige former og slægtninge, navnlig *C. semisanguineus* og endvidere talrige *Gomphidius glutinosus* Schaeff., *Camarophyllus caprinus* Scop. og grå *Limacium*-arter, medens vejkanter o. l. var oversået med *Hebeloma punctatum* Fr. (?) o. a. former, *Hygrocybe miniata* Fr. o. s. v.

Alt dette frembyder således et rigt felt for myco-floristiske iagttagelser. Den vedføjede liste over fundne agaricineer (og enkelte andre svampe) kan (med sine 130 arter) naturligvis ikke give et blot tilnærmelsesvis fuldstændigt udtryk for floraen. Ikke alene er dette umuligt ved et enkelt, kortvarigt besøg, selv om det lykkedes at finde alt, hvad findes kan, men overfloden på arter og mangel på mikroskopisk undersøgelse umuliggjorde i mange tilfælde bestemmelsen af vanskeligere former og arter. Ikke desto mindre mener jeg, den vil kunne have en del interesse i betragtning af, hvor lidet der endnu er fremkommen om svampe-floraen i de enkelte egne af vort fædreland, særlig Jylland.

I fortegnelsen er voksestedet i regelen antydet, idet et G. betyder nåleskov, B. betyder bøgeskov, L. løvskov, Bl. blandet skov af nåle- og løvtræer .

Amanita

phalloides Vail. *(virescens)*. — Fugtig B. (sjælden).
virosa Fr. — (gamle ex., der syntes at tilhøre denne art forek. ret alm. i Bl.)
mappa Fr. — Alm. i G.
porphyria Fr. — Alm. i G.
* *muscaria* L. — G.
pantherina DC. — B.
rubescens Fr. — L. og G.
vaginata Bull. — B. sjælden.

Lepiota

procera Scop. — Bl.
amianthina Scop. — G.
carcharias. — G., Mos.

Armillaria

mucida Schrad. — B.
mellea Fl. D. — L. og G.

Tricholoma

* *equestre* L. — G.
* *flavo-brunneum* Fr. — G.
pessundatum Fr. — G. og L. Lyng v. gran.
resplendens Fr. — L.
* *rutilans* Schaeff. — G.
* *vaccinum* Pers. — G.
imbricatum Fr. — G.
* *saponaceum* Fr. — G.
sulphureum Bull. — B. sjælden.
virgatum Fr. B.

Clitocybe

cerussata Fr. — Skovbryn v. brændestabel.
odora Bull. — B. (sj.), G. (sj.).
elixa Sow.[1]). — G.
laccata Scop. *(Laccaria)* — overalt.

Collybia

radicata Relh. — B. (G.).
stridula Fr.[2]).

butyracea Bull.[3]) — B., G. (var *pilosa*).
maculata A. & S. — G.
tuberosa Bull. — (På *Lactarius deliciosus*).
stolonifera Jungh.[4]) — Bl. et expl.

Mycena
epipterygia Scop. — G.
lactea Pers. — G.
galopus Pers. — Tørvemose (et ex.). Moseform.
galericulata Scop. — B. (et ex.).

Omphalia
* *pseudoandrosaceus* Bull. [5]) — Hedemose v. G.
nigrella Weinm.[6]) — Sandmark.

Pluteus
cervinus Schaeff. — B. (også på B.-stubbe i G.).

Entoloma
* *sericellum* Fr. — Græsmark.
rhodopolium Fr. — B.
ardosiacum Bull.[7]) — Fugtigt græs, sj.

Nolanea
pascua Pers.[8]) — Tørvemose.

Leptonia
placida Fr. — (Overgangsform til *L. lappula)*. Bøgestød.

Eccilia
sp.? ((*polita* Pers.? minor. *parkensis* Fr.[9]). — Mosegrøft. (En lille, 1 cm bred svamp).

Pholiota
caperata Pers. (*Rozites*). — B.
mutabilis Schaeff. — B.

Inocybe
geophylla Sow. — Bl.
lacera Fr. — Vej i ung G. på bakke.

Hebeloma

crustuliniforme Bull. — Vej i granpl.

punctatum Fr.[10]) — Vej i ung G. (mest solbrune former).

Cortinarius

Phlegmacium

glaucopus Schaeff.[11]) — G. mellem bøgeblade.

purpurascens Fr. — G.

caerulescens Fr. — Mos i G.

Myxacium

collinitus Sow. — G. (og Bl.).

elatior Fr. — B.

Inoloma

* *traganus* Fr. — G.

callisteus Fr. — G. i mos.

Dermocybe

cinnabarinus Fr. — B.

cinnamomeus L. — G.

semisanguineus. — G.

Hydrocybe

firmus Fr.?[12]) (måske C. *subferrugineus*).

Naucoria

cerodes Fr. — Moshede.

Galera

hypnorum Batsch. — Mos i mosehuller.

Psalliota

arvensis Schaeff. — Hist og her i mark og skov.

Stropharia

aeruginosa Curt. — B. (sj.).

semiglobata Batsch. — Gødning (også dyre-fald, loc. div.).

Hypholoma

fasciculare Huds. — G. og L.

lateritium Fr. [13]) — L.

Psilocybe

uda Pers. — Hedemose.

* *atrorufa* Schaeff. [14]) — (var. = *montana* Pers.) Sandbakke, i plantehuller.

* semilanceata Fr. — Vejrabat.

foenisecii Pers. — Vejrabat etc.

Panaeolus

separatus L. *(Anellaria).* — Kogødning ved søbred.

campanulatus L. — Gødning.

Psathyrella

squamifera Karst. — Mose på småpinde.

Coprinus

comatus Fl. D. — Ved havehegn.

plicatilis Curt. — I græs.

domesticus Pers. ?[15]) — På gødning i eng.

Bolbitius

vitellinus Pers. — Eng på hestegødning.

Limacium

eburneum Bull. — B.

penarium Fr. — B.

sp. *(livido-album* var. *Lucandii?,* står nær *L. agathosmum)* — Mos i G. alm.

Hygrophorus

Camarophyllus

virgineus[16]) — Overdrev.

* *pratensis* Pers. — Overdrev.

caprinus Scop.[17]) — G.

Hygrocybe

* *nitratus* Pers. — Overdrev.

miniatus Fr. — Mose, skovbakkevej.

* *laetus* Pers. — Moseeng ved skov.

Lactarius

* *vellereus* Fr. — B.

* *pargamenus* Sw.[18]) — B. (overgang til *piperatus).*

deliciosus L. — G.
blennius Fr. — B. G.
subdulcis Bull. — G. B.
mitissimus Fr. — G.
volemus Fr. — B.
helvus Fr. — Lyngmose, granskovbryn.
pallidus Pers. — B. Bl.
turpis Weinm. — Granskov-mose.

Russula

ochroleuca Pers.
furcata Pers. — B.
fellea Fr. — G. (alm.).
integra L. — Skov og ved søbred.
foetens Pers. — Åben skovplads; Bl.
nigricans Bull. — B. (G.).
adusta Pers. — B.
delica Fr. — B.
emetica Harz. — G. B. hedekrat o.s.v.

Gomphidius

glutinosus Schaeff. — G.

Marasmius

alliaceus Jacq. — B.
perforans Fr. — G.
ramealis Bull. — Enebærgren.
oreades Bolt. — Vejkant.
scorodonius Fr. — G.-skovbryn og markdige.

Lentinus

cochleatus Pers. — B.

Paxillus

involutus Batsch. — G.; v. mose.
atrotomentosus Batsch. — G.

Boletus

cyanescens Bull. — Bøgeskov (ved vej, bakke).
piperatus Bull. — G.
variegatus Swartz. — Fyrreplant.

scaber Fr. — Hede, skov.
luteus L. — Granskov.
elegans Schum. — Nåleskov (Lærk).
bovinus L. — Hedeplant. under fyr.
pachypus Fr. — G. B.
edulis Bull. — G. B.
luridus Schaeff. — L.

Cantharellus

cibarius Fr. — G. (B.).
aurantiacus Wulf. — G.
infundibuliformis Scop. — G.

Supplerende liste fra 1898, ca. 16.—18. oktober:

Tricholoma personatum — B.; *Clitocybe hirneola* — Græskant v. skov; *C. fragrans* — Mos v. skovvej; *C.* sp. nær *fumosa*[19]) — Græskant v. granskov; *C. pithyophila* — G.; *Collybia erosa* ? — G; *C. cirrhata* — Mosmose; *C. tenacella* — Moserand i G.; *Mycena filopes* — I sphagnum; *M. pura* — B. sj.; *Clitopilus orcella* — G.; *Pholiota marginata* — G.; *P. mustelina*[20]) — Bøgestub; *Hebeloma mesophaeum* — G.; *Clypeus Tricholoma*[21]) — G.; *Flammula lenta* — B. (G.); *Cortinarius tophaceus; C. uliginosus ?* — Sphagnum i G.; *C. scandens;* — * *Stropharia caput medusae* — G.; *Hypholoma capnoides* — G.; * *Psilocybe uda* var. *sphagnorum*[22]) — Hedemose; * *Hygrophorus cinereus* — Græs v. bakkefod; *H. psittacinus* — Græs v. bakkefod; *Lactarius glyciosmus* — G.; *L. rufus* — G.; *Russula fragilis ?; R. lactea*[23]) ? — B. enlig, gulsporet; *Marasmius urens* — G.

Den her gengivne artikel hører til de første mykofloristiske beskrivelser, der er skrevet herhjemme. Den er et resultat af en af de få større indsamlingsrejser, min far foretog; som regel foretrak han een-dags ekskursioner, der kun sjældent gik uden for Fyn. Ikke færre end 16 arter er på denne rejse blevet malet til „Flora Agaricina Danica"*), og talrige andre er blevet mere eller mindre detailleret beskrevet og indført i beskrivelsesprotokol.

I manuskriptets artsliste er med blyant tilføjet en række navne og notater. Det fremgår af notaterne på akvareller af 3 af disse arter, at tilføjelserne stammer fra en anden rejse i tiden 16.—18. oktober

*) I listen mærket med *.

1898. Der er ikke taget hensyn til disse tilføjelser i artiklens hovedtekst, og de er her trykt som en supplerende artsliste. Far foretog endnu en rejse til Rold i september 1900, hvor han malede 14 akvareller, men nogen artsliste fra denne rejse findes ikke opbevaret.

Jeg har kun rettet rene skrivefejl i artiklen. De anvendte navne er i hovedsagen de samme som i „Flora Agaricina Danica". Hvor afvigende navne forekommer, har jeg ved gennemgang af min fars beskrivelsesprotokol i de fleste tilfælde kunnet finde frem til de siden anvendte navne, der er opført i nedenstående liste. Bemærkninger i anførselstegn er citeret fra beskrivelsesprotokollen, hvor notatet da har haft direkte sigte på materiale fra Rold-rejserne.

1. *C. elixa:* „Måske en *Camarophyllus* eller *Limacium*".
2. *C. stridula: Tricholoma stridulum* v. *pallidipes.*
3. *C. butyracea* var. *pilosa:* var. *trichopus* Pers.
4. *C. stolonifera: C. tenacella.*
5. *O. pseudoandrosaceus: O. umbellifera* var. *albida.*
6. *O. nigrella:* Formentlig en fejlskrift for. *O. grisella* (Weinm.).
7. *E. ardosiacum:* Enten *Rhodophyllus griseo-cyaneum* var. eller *R. nitidum.*
8. *N. pascua: R. staurospora.*
9. *E. polita* var. *minus:* „Måske *R. apiculatus* Fr."
10. *H. punctatum: Hebeloma mesophaeum.*
11. *C. glaucopus: C. cyanopus.*
12. *C. firmus:* Ikke senere omtalt af J.E.L.
13. *H. lateritium: H. sublateritium.*
14. *P. atrorufa: P. bullacea.*
15. *C. domesticus:* ? tilføjet 1898. Åbenbart en fejlbestemmelse.
16. *H. virgineus:* I 1898 rettet til *H. niveus.*
17. *H. caprinus:* J.E.L. har malet og beskrevet denne art i 1941 og angav da aldrig tidligere at have set arten, så opgivelsen her er meget tvivlsom.
18. *L. pargamenus: L. piperatus* var. *pargamenus.*
19. *C. fumosa:* Formentlig en art af *Difformes*-gruppen.
20. *P. mustelina:* Ikke senere omtalt af J.E.L.
21. *C. Tricholoma: Paxillopsis tricholoma.*
22. *Psilocybe uda* var. *sphagnorum: P. u.* f. *sphagnicola.*
23. *R. lactea:* Tvivlsom angivelse.

København, Maj 1953. Morten Lange.

TRE EJENDOMMELIGE TREMELLA-ARTER:

TREMELLA MYCOPHAGA Martin, TREMELLA SIMPLEX Jacks. & Martin OG TREMELLA OBSCURA (Olive) comb. n. PAAVIST I DANMARK

Af M. P. CHRISTIANSEN

Under Studiet af Danmarks resupinate Svampearter blev Forf. af nærværende Afhandling i Aaret 1949 opmærksom paa en lille *Tremella*-Art, der voksede, snyltede, paa Frugtlegemer af *Aleurodiscus amorphus* (Pers.) Rabenh. paa *Abies alba*. Da Arten forekom hyppig paa sit specielle Voksested, var det mig paafaldende, at den ikke kunde findes i den europæiske Svampelitteratur; Arten var aabenbart ikke beskrevet. Det var den imidlertid, i U. S. A.! Professor H. S. Jackson i Toronto og hans Medarbejdere havde fundet Arten og sendt den til Professor G. W. Martin, Iowa, som beskrev den under Navnet *Tremella mycophaga* Martin i „Mycologia" 32, p. 686, 1940. Professor Martin oplyser i øvrigt, at Dr. Stork (Amer. Jour. Bot. 7 : 447—448, 1920) under sine Undersøgelser af *Aleurodiscus amorphus* havde fundet, beskrevet og illustreret Arten, men uden at navngive den.

I „Sydowia" 7, 1953, meddeler Dr. Albert Pilát, at *Tremella mycophaga* i Europa første Gang blev fundet i Bøhmen af Professor K. Kavina, der i sit Herbarium gav den Navnet *Dacrymyces parasiticus* Kavina, men han beskrev den ikke. Dr. Pilát har i Prag undersøgt ældre Fund af *Aleurodiscus amorphus* og fundet Snylteren paa 13 af 53 Kollektioner. Disse 13 Fund fordeler sig saaledes : 9 i Tjekkoslovakiet, 1 i Østerrig, 1 i Jugoslavien, 1 i Italien og 1 i Sverige. Arten synes saaledes at være vidt udbredt i Europa.

Tremella simplex Jacks. & Martin, der ligeledes er beskrevet af Professor G. W. Martin i 1940, blev først konstateret her i Landet i Efteraaret 1953, ogsaa paa *Aleurodiscus amorphus;* i Amerika er den fundet paa en anden *Aleurodiscus*-Art og kun paa denne. Arten kan makroskopisk næppe skelnes fra *T. mycophaga,* men mikroskopisk afviger den fra denne ved Mangel paa Øskenceller og ved sine 2-cellede Basidier; *T. mycophaga* har mange og tydelige Øskenceller og oftest 4-cellede Basidier.

Forf. har haft Lejlighed til at undersøge ældre Materiale af *Aleurodiscus* i Botanisk Museum og i Landbohøjskolens plantepatologiske Afdeling, og *Tremella mycophaga* blev mærkelig nok ikke fundet her, hvorimod *Tremella simplex* fandtes paa 11 af de undersøgte 24 Fund; af disse 11 Fund er de 7 fra Danmark, 2 fra Sverige, 1 fra Østerrig og 1 fra Tjekkoslovakiet.

Den tredie *Tremella*-Art, som her skal omtales, vokser inden i Frugtlegemer af *Dacrymyces*-Arter. Mikroskopisk stemmer denne Art næsten overens med *Tremella mycophaga* og blev paa Grund af denne Overenstemmelse af Lindsay S. Olive i „Mycologia" 38, p. 540, 1946, beskrevet som en Varietet af *Tremella mycophaga* og benævnt *T. mycophaga* Martin var. *obscura* Olive. Han var imidlertid klar over, at Arten i visse Henseender afviger stærkt fra *Tremella mycophaga;* den mangler selvstændigt Frugtlegeme, og dens Værtplante er en hel anden. Han skrev : „Two important differences exist between these two fungi. *T. mycophaga* possesses distinct fructifications, while the new variety does not; that is, *T. mycophaga* var. *obscura* grows within the fructifications of *Dacrymyces* and has no distinct form of its own. Furthermore, the conidia of *T. mycophaga* are mostly subglobose, whereas those of the new variety tend to be more elliptical. It may be that these differences are sufficiently outstanding to justify the establishment of a separate species for the fungus." Disse Forskelligheder synes efter nærværende Forf. at være tilstrækkelige til at give *Dacrymyces*-Snylteren Artsrang, hvorfor den her vil blive beskrevet under Navnet *Tremella obscura* (Olive) comb. n.

Nedenfor følger en nærmere Beskrivelse af de tre Arter med Angivelse af de hidtil konstaterede danske Findesteder.

For Laan af ældre Materiale af *Aleurodiscus amorphus* og af *Dacrymyces*-Arter takker jeg her Direktør for Botanisk Museum, Professor Knud Jessen og Professor ved Landbohøjskolen N. Fabritius Buchwald.

Følgende Forkortelser er anvendt:

L. Pl. A. = Den kgl. Veterinær- og Landbohøjskoles plantepatologiske Afdeling.
B. M. = Københavns Universitets botaniske Museum.
N. F. B. = N. Fabritius Buchwald.
E. R. = E. Rostrup (1831—1907).
O. R. = O. Rostrup (1864—1933).
(!) = Forfatteren.
F. = Fyn; J. = Jylland; S. = Sjælland.

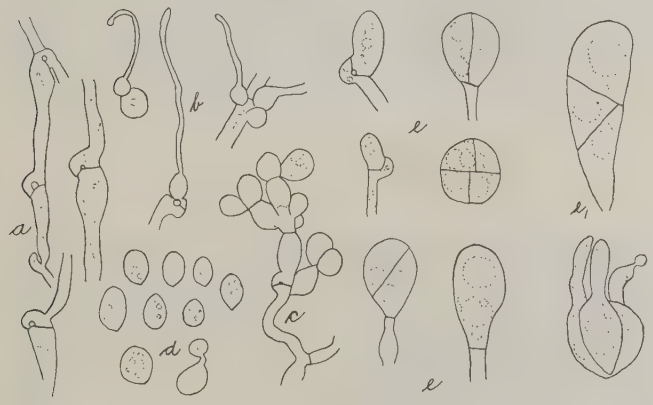

Fig. 1. *Tremella mycophaga* Martin.
a. Hyfer; b. Haustorier (?); c. Hyfe med Konidier; d. Konidier; e. Unge Basidier; e_1. En ældre og en afvigende Basidie. a-d og e_1 × 1000, e × 700; (fra 2020).

1. **Tremella mycophaga** Martin. Mycologia 32, p. 686, 1940. Fig. 1—3.

Paa *Aleurodiscus amorphus* (Pers.) Rabenh. paa afhugne Grene af *Abies alba.*

Amager, Kongelunden, 12.12.1949 (Nr. 553) (!), 14.4.1952 (2020) (!) og senere Aar. S. Hareskoven, 2.1.1954 (2021) (!).

Frugtlegemet 0,3—1 mm bredt, skiveformet med svagt bølget, glat Overflade, først blegt, hyalint, senere lyst gulbrunt eller næsten ravfarvet, kødet-gelatinøst, ofte mange Frugtlegemer sammen og da

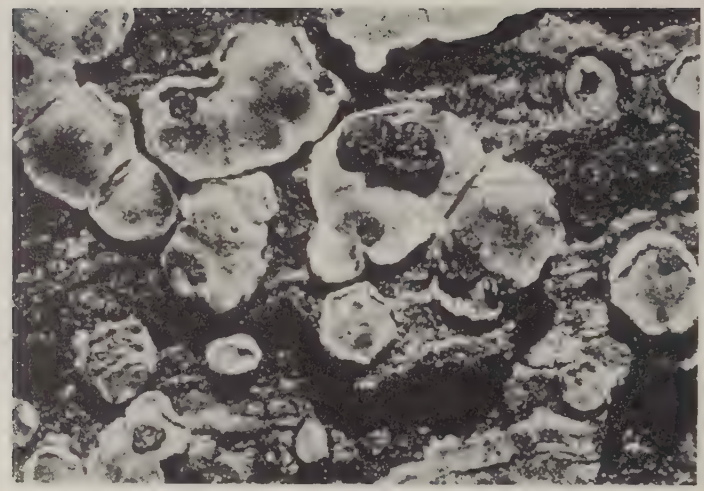

Fig. 2. *Tremella mycophaga* paa *Aleurodicus amorphus*.
Amager, Kongelunden 14.4.1952. Leg. *M. P. Christiansen* Koll. 2020; fot. *E. Hellmers* 12.3.1954 — Ca. × 20.

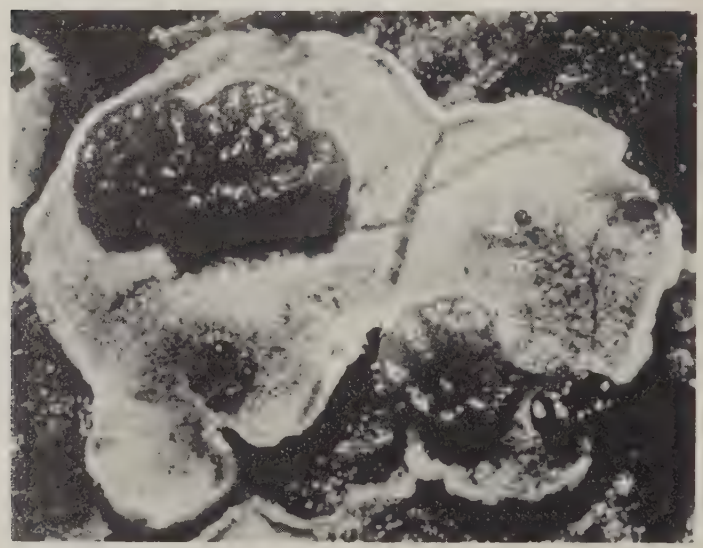

Fig. 3. *Tremella mycophaga*.
Detail af Fig. 2. — 14.4.1952. Koll. 2020. — Ca. × 50.

sammenvoksede og dækkende hele Værtsvampen; i meget fugtigt Vejr udflydende, i indtørret Tilstand hornagtigt og mørkere i Farven.

Hyfer uregelmæssige, tyndvæggede, 1,5—3,8 μ brede, grenede, med Tværvægge og tydelige Øskenceller, i Spidsen ofte med mange Konidier; ganske tynde 0,5 μ brede Hyfer (Haustorier ?) er til Stede i ret stor Mængde; de udspringer fra Hyferne eller Konidierne og er ved Basis kugleformet opsvulmede.

Konidier næsten kugleformede, 3—5 μ i Diameter, eller omvendt ægformede, 3,5—6 × 2—4 μ, med grynet Indhold.

Basidier paa særlige Hyfer eller paa samme Hyfer som Konidierne; Probasidier kugleformede-pæreformede, 11—21 × 10—14 μ, med Gryn og Draaber, 2- eller 4-delt ved lodrette eller skraatstillede Vægge; dog træffes ogsaa Basidier, der er mere langstrakte og ved en Tværvæg delt i 2 Celler. Epibasidier indtil 80 μ lange og ca. 2,5 μ brede.

Basidiesporer ikke set. (G. W. Martin angiver, at Sporerne er kugleformede og 6—8 μ i Diameter).

Arten er ny for Danmark. Se i øvrigt Indledningen.

G. W. Martin (1952) angiver Arten fra Ontario, Quebec, New York, Georgia og Louisiana.

Fig. 4. *Tremella simplex* Jacks. & Martin.
a. Hyfer med Konidier; b. Haustorier (?); c. Konidier; d. Hyfe med Probasidier; e. Todelte Basidier, den ene med Epibasidier; alle × 1000; (fra 3402).

2. **Tremella simplex** Jacks. & Martin. Mycologia 32, p. 687, 1940.

Fig. 4—6.

Paa *Aleurodiscus amorphus* (Pers.) Rabenh. paa afhugne Grene og fældede Stammer af *Abies alba*.

Fund fra Danmark:

S. Høbjærg Hegn, 9. 1915 (O. R.) 3064 (L. Pl. A.); Geel Skov, 11. 1917 (C. Raunkiær) (B. M.); Grønnemose Skov, 24.2.1935 (L. Pl. A.); Tværsted Plantage (Hestehave) 7458 (L. Pl. A.); Mogenstrup Aas 4.10.1953 (3402) (!); do. (N. F. B.). — Amager, Kongelunden, 20.1.1954 (3521) (!). — J. Vandet Plantage, Thy, 4.9.1952 (N. F. B.).

Fund uden for Danmark:

Sverige: Västergötland, Väne-Ålaka, 23.8.1937 (Exc. suec. Nr. 745, leg. F. Nathorst Windahl) (B. M.); Omberg, 28.10.1894 (Gunnar V. Schotte) (B. M.).

Østerrig: Beernan pr. Arbesback, m. Aug. (3247 A. Zalbruckner) (B. M.).

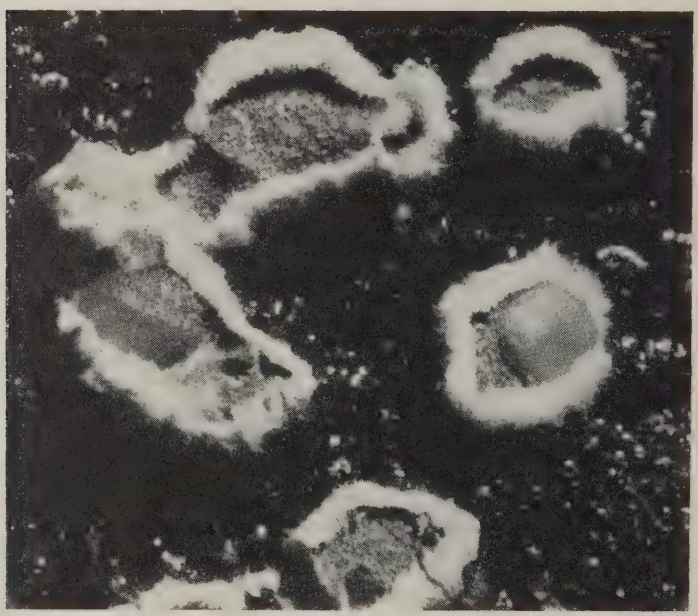

Fig. 5. *Tremella simplex* paa *Aleurodiscus amorphus*.
J. Vandet Plantage 4.9.1952. Leg. *N. F. B.*; fot. *E. Hellmers* 12.3.1954.
Ca. × 20.

Tjekkoslovakiet: Bøhmen, Tepletz, 5. 1873. B. M.

Frugtlegemet 0,3—1 mm bredt, skiveformet, kødet-gelatinøst, glat, hyalint til lyst gulbrunt, indtil 20 Frugtlegemer paa samme Frugtlegeme af Værtplanten og da sammenvoksede til en uregelmæssig Pude af mørkere gulbrunlig til rødbrunlig Farve; i indtørret Tilstand hornagtigt, mørkere.

Hyfer hyaline, uregelmæssige med vinkellignende Udvidelser, 2—3 μ brede, tyndvæggede, med Tværvægge, men uden Øskenceller, i Spidsen bærende mange runde-ovale Konidier; lange 0,5 μ brede Haustorier (?) er ofte til Stede i stor Mængde; de udgaar fra Hyferne og Konidierne og er ved Basis kugleformet opsvulmede.

Konidier 3—5 μ i Diam. eller 5—6×3—4 μ, grynede.

Probasidier kugleformede-ovale, paa samme Hyfer som Konidierne, 8—12 μ i Diam. eller 10—12 × 9,5 μ, delt i 2 Celler ved en lodret

Fig. 6. *Tremella simplex.*
J. Vandet Plantage 4.9.1952. Leg. *N. F. B.;* fot. *E. Hellmers* 12.3.1954.
Ca. × 30.

eller mere eller mindre skraatstillet Væg; hos mere langstrakte Basidier (14 × 9 μ) kan Væggen være helt tværstillet; alle Basidier er mere eller mindre grynede og med store Oliedraaber; Epibasidier indtil 70 μ lange og 3 μ brede.

Basidiesporer ikke set. (Ifølge G. W. Martin skal Sporerne være rundagtige og 6,5—8 μ i Diam.).

G. W. Martin (1940) fremsætter den Formodning, at *T. simplex* muligvis er en haploid Form af *T. mycophaga* (ingen Øskenceller, 2-cellede Basidier etc.), men mener dog, at det er berettiget at give den et distinkt Navn, da den (i Amerika) er fundet paa en *Aleurodiscus* sp., som ikke er Værtplante for *T. mycophaga*. Hos os forekommer imidlertid begge disse *Tremella*-Arter paa samme Værtplante, *Aleurodiscus amorphus*, hvorfor G. W. Martin's Formodning synes i høj Grad at være sandsynlig.

Arten er ny for Danmark og Europa.

G. W. Martin (1952) angiver Arten fra Ontario og Quebec.

3. **Tremella obscura** (Olive) comb. n.

Syn. : *Tremella mycophaga* Martin var. *obscura* Olive, Mycologia 38, p. 540, 1946.

Fig. 7.

Snyltende inde i *Dacrymyces*-Arter.

Svampens Konidieform er fundet paa *Dacrymyces deliquescens* Bull.) Duby fra følgende Lokaliteter:

Amager, Kongelunden, 3.12.1953 (3488) (!) og 14.12.1953 (3507) (!). — S. Hornbæk Plantage, Jan. 1935 (N. F. B.) (L. Pl. A.); Jægersborg Dyrehave, 22.11.1953 (2024) (!); Hareskoven, 2.1.1954 (3520) (!); Kattehalemose ved Ravnsholt Skov, Jan. 1954 (Bregnhøj Larsen). — F. Skaarup, 4. 1877 (O. R.) (L. Pl. A.).

Basidieformen er fundet paa Konidieformen af *Dacrymyces deliquescens* (paa *Sambucus nigra)* i S. Kattehalemose ved Ravnsholt Skov, Jan. 1954 (Bregnhøj Larsen).

Tremella obscura danner intet selvstændigt Frugtlegeme. Hele Svampen befinder sig inden i Værtplanten, her *Dacrymyces deliquescens*, og i et Tværsnit af denne kan man finde Snylteren spredt i Værtplantens Væv, saa de to Planter danner et Hele, der synes at høre sammen. Snylterens Konidieform, som Forf. først blev opmærksom paa, blev da ogsaa oprindelig af denne tydet som en særlig Konidieform af *Dacrymyces*-Arten. Da Snylterens Basidieform med *Tre-*

mella-Basidier senere blev fundet i en *Dacrymyces*, laa den rigtige Tydning lige for: Det var en *Tremella*-Art, der optraadte som Snylter, og som kunde identificeres med ovennævnte Varietet, men maa betragtes som en selvstændig Art (se Indledningen).

Hyfer cylindriske, tyndvæggede, med tydelige Øskenceller, mod Spidsen stærkt grenede, bærende Konidier eller Basidier; tynde Haustorier (?) er til Stede; de udgaar fra Hyferne og er som hos de foregaaende Arter kugleformet opsvulmede ved Grunden.

Konidiebærere stærkt grenede, med Øskenceller og mange øskenagtige Dannelser. Konidier kugleformede-ellipsoidiske, med tydelig, ret solid Væg, 5—8 μ i Diameter eller 6—10 × 4—8 μ, ofte stærkt grynede.

Probasidier kugle- til pæreformede, delt ved lodrette eller $\frac{+}{+}$ skraatstillede Vægge i 2—4 Celler, 7—13 × 6—10 μ, grynede og med store Oliedraaber.

Epibasidier indtil 50 μ lange.

Basidiesporer rundagtige-ægformede, ca. 6 × 5 μ og spirer med en Sekundærspore.

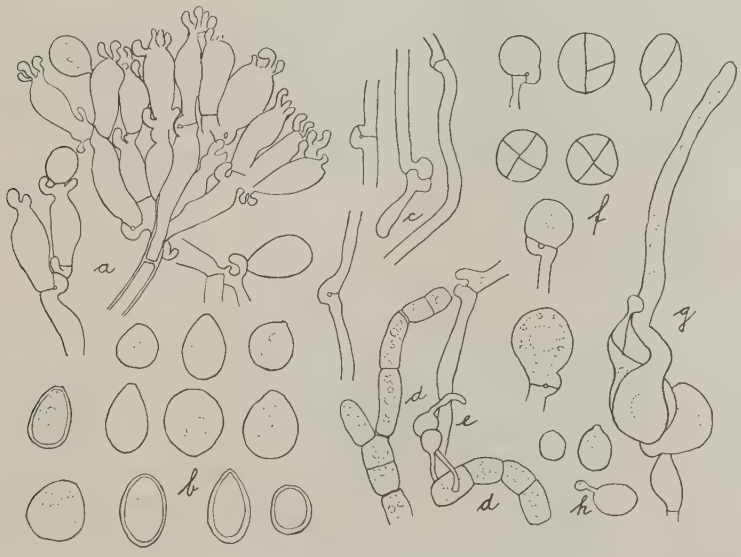

Fig. 7. *Tremella obscura* (Olive) comb. n.

a. Konidiebærere; b. Konidier; c. Hyfer; d. Konidier fra Dacrymyces deliquescens; e. Haustorier (?); f. Probasidier; g. Tredelt Basidie med Epibasidier; h. Sporer; alle × 1000; (a og b fra 3488, c—h fra Kattehalemose).

Maalene paa Probasidier og Basidiesporer er noget mindre i det danske Materiale end angivet for Original-Materialet af Lindsay S. Olive (Basidier 8—11,7 μ × 9,8—15 μ; Sporer 4,2—6,5 × 5,9—9,1 μ).

Tremella obscura er ny for Danmark og Europa.

Lindsay S. Olive (1946) angiver Arten fra Georgia, snyltende i *Dacrymyces minor* Peck og *Dacrymyces deliquescens* Duby og (1948) fra Louisiana, hvor den snyltede i *Dacryomitra stipitata.*

SUMMARY

Three peculiar species of the genus Tremella: Tremella mycophaga Martin, Tremella simplex Jacks. & Martin and Tremella obscura (Olive) comb. n. recorded from Denmark.

Detailed descriptions are given of three species of *Tremella* which recently have been recorded from Denmark, namely : *Tremella mycophaga* Martin and *Tremella simplex* Jacks. & Martin, both parasitic on *Aleurodiscus amorphus* (Pers.) Rabenh. on *Abies alba* and *Tremella obscura* (Olive) comb. n. (Syn.: *Tremella mycophaga* Martin var. *obscura* Olive) without fruit bodies, but parasitic within the fructifications of *Dacrymyces deliquescens* (Bull.) Duby.

Tremella simplex and *Tremella obscura* are probably new to Europe.

LITTERATUR

Martin, G. W.: Some Heterobasidiomycetes from eastern Canada. Mycologia 32, p. 686 og 687, 1940.

— Revision of the north central Tremellales. Univ. Stud. Nat. Hist. 19, 1952.

Olive, Lindsay S.: Some taxonomic notes on the higher Fungi. Mycologia 38, p. 540, 1946.

— Taxonomic notes on Louisiana fungi—II. Tremellales. Mycologia 40, p. 593, 1948.

Pilát, A.: Über das Vorkommen und die Verbreitung von Tremella mycophaga Mart., in Europa. Sydowia 7: 316—320, 1953.

København, Marts 1954.

DIE ABSCHLEUDERUNG DER SPOREN VON SPOROBOLOMYCES – SPIEGELHEFE – GEFILMT

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Einleitung. Die Sporen der meisten Basidiomyceten werden durch einen besonderen Mechanismus, den Tropfenmechanismus, abgeschleudert. Dies ist bei sämtlichen Hymenomyceten (*Aphyllophorales, Agaricales*) und Phragmobasidiomyceten, zu denen auch die Familie *Sporobolomycetaceae* mit den Genera *Bullera, Itersonilia* und *Sporobolomyces* gehören, der Fall. Der erste, der das Abschleudern der Basidiosporen beobachtet hat, ist Brefeld. Er schreibt (1877, p. 65) über *Coprinus stercorarius* folgendes: „Die Sporen werden durch Aufplatzen der Sterigmen abgeschleudert. Die Basidien sind vor dem Abwerfen der Sporen elastisch gespannt, eben darum erfolgt ein plötzlicher Ruck, wenn die Sporen abgeworfen werden". Fayod (1889, p. 271—272) berichtet über diesen Vorgang bei *Galera tenera:* „J'ai vu trés distinctement que le jet de liquide qui parait projeter la spore provient non pas directement de l'intérieur du stérigmate, mais d'une goutte d'eau que l'on voit se former à la base du hile et disparaître lorsqu'elle a atteint une certaine grosseur, parce qu'elle arrive à toucher l'exospore qui est humide et qu'elle se répand à la surface de la spore opposée à l'observateur. On conçoit que lorsque la spore est projetée, évidemment par liquéfaction de la couche moyenne de la cloison basilaire du hile et distension subite des couches marginales de cette dernière."

Die folgenden Bezeichnungen seien noch definiert: Hilum = der Nabel, d. h. die Stelle, wo Sterigma und Spore in Verbindung sind. Apiculus = Étirement hilaire = die kleine Papille an dem einen Ende der Sporen. An der Spitze des Apiculus oder in kleiner Entfernung davon ist der Hilum. Isthmus = Die engste Stelle des Sterigmas.

Der Tropfenmechanismus fungiert demnach folgendermassen: Einige Sekunden bevor die Abschleuderung der Sporen stattfindet, bildet sich an der Spitze des Sterigmas, also am Hilum der Sporen, ein kleiner Tropfen. Dieser wächst schnell heran und erreicht in wenigen Sekunden -- bei *Sporobolomyces* in 2--3 Sekunden — seine maximale Grösse. Sein Diameter ist dann 3 μ, etwa $^3/_4$ von dem der Sporen. Nach weiteren 2—3 Sekunden werden Tropfen und Spore, wie es scheint in demselben Augenblick, abgeschleudert. Bei *Sporobolomyces* vergehen 7 Sekunden von der ersten Wahrnehmung des stark lichtbrechenden Tropfens bis zum Zeitpunkt der Abschleuderung. Von *Sporobolomyces salmonicolor* werden die Sporen, nach Messungen von Herrn Bille-Hansen, sowohl in horizontaler wie in vertikaler Richtung bis 0,4 mm weggeschleudert.

Die Basidiosporen werden durch den Tropfenmechanismus nur bis 0,4 mm weggeschleudert. Diese Entfernung steht in einem invers proportionalem Verhältniss zu der Zahl der abgeschossenen Sporen. Nach Buller (1909, 1922) wird von einem einzelnen Fruchtkörper von *Psalliota bispora* 4×10^9 Sporen innerhalb 2—3 Tagen und von einem einzelnen Fruchtkörper von *Polyporus applanatus* 5×10^{12} Sporen innerhalb eines Jahres abgeschleudert. Den Rekord hat aber ein grosser Fruchtkörper von *Polyporus fomentarius,* der innerhalb eines halben Jahres insgesamt 10^{13} Sporen abschleuderte (Buchwald 1938); das ist ungefähr 6×10^{10} oder 6,6 g Sporen pro 24 Stunden. $6\times10^{10}\times0{,}1$ mm sind immerhin 6000 km pro 24 Stunden! Die für diese Prästation notwendige Energie ist indessen nur ungefähr 0,008 cal, da die Anfangsgeschwindigkeit von der Grössenordnung 75 cm/Sekunde ist.

Filmung der Sporenabschleuderung. Um die bei dem Tropfenmechanismus wirksamen Kräfte zu finden, erschien es wünschenswert, die Abschleuderung der Sporen zu filmen. Erst wurde mit *Coprinus radiatus* (Bolt.) Fr. versucht. Der Hut dieser kleinen Art ist dünn und durchsichtig. Aber die für die Aufnahmen notwendige Lichtintensität konnte von den reifen Basidien nicht ertragen werden.

Darum wurden Kulturen von *Sporobolomyces salmonicolor* (F. et Br.) Kl. et v. N. verwendet. *Sporobolomyces* (Spiegelhefe) ist ein hefeähnlicher Pilz, dessen Basidien nur eine Sterigma bilden. Die Sporen werden, wie bei den meisten Basidiomyceten, durch den Tropfenmechanismus abgeschleudert.

Die Kultur von *Sporobolomyces* erfolgte auf 3 % Malzextract mit 1 % Difco Bactoagar, 15 Minuten bei 120° sterilisiert. Für die Auf-

nahmen war es notwendig, ein Immersionsobjektiv zu verwenden. Zwischen dem Objektiv und Pilz musste man darum ein Deckglas anbringen. Es wurden Immersionsdeckgläser mit einer Dicke von 0,08—0,12 mm verwendet. Mit einem warmen Spatel wurden 1 bis 2 Tropfen von flüssigem Malzextractagar schnell über das Deckglas ausgestrichen, so dass die Agarschicht nicht mehr als 0,2 mm betrug. Diese Agarplatte wurde unmittelbar danach auf feuchtem Filtrierpapier auf dem Boden einer Petrischale angebracht. Als Deckel diente eine stark schiessende, 24 Stunden alte Kultur von *Sporobolomyces*. In dieser Weise sind die mit Agar bestrichenen Deckgläser geimpft worden.

Nach einer Beschiessung mit Sporen (Impfung) von einer Stunde, wurden die geimpften Deckgläser in eine feuchte Kammer gebracht. Diese bestand entweder aus auf Spateln gelegte Objektgläser, die in grossen Petrischalen mit feuchtem Filtrierpapier angebracht waren, oder aus Porzellankästchen, die sich unter einer Glasglocke befanden.

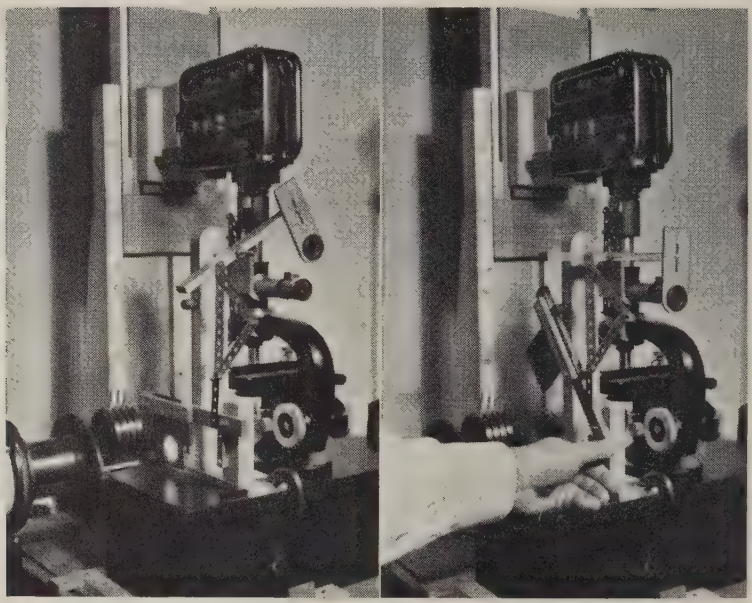
Die Abschleuderung von Sporen erreicht ein ausgesprochenes Maximum 18 Stunden nach der Impfung. Die Feuchtigkeitsverhältnisse müssen so reguliert werden, dass der Feuchtigkeitsgehalt zwar weniger als 100 % ist, jedoch nicht so klein, dass der Pilz in seinem Wachsen behindert wird.

Bei dem Filmen geht das Bild der Sporen u.s.w. durch eine Agarschicht*) von ungefähr 0,2 mm, durch ein Deckglas von 0,08—0,12 mm, durch Immersionsöl und in das Objektiv herein.

Während des Photographierens wird das geimpfte Deckglas als Deckel einer kleinen feuchten Kammer, Tiefe 1,5 mm, unter dem Mikroskop angebracht. Bei einer Bildfolge von 24 Aufnahmen pro Sekunde und Breite des Bildfeldes von 280 μ wurde das Objektiv Apochromat H 60 ×, num. Apert. 1,00 (Ölimmersion) und Huyghens-Okular 5 × verwendet. Bei 64 Aufnahmen pro Sekunde und einer Breite des Bildfeldes von 80 μ wurde ein Objektiv H 160 ×, num. Apert. 1,00 (Ölimmersion) und Kompensationsokular 20 × benutzt. Die optischen Geräte waren Zeiss/Jena-Fabrikate und der verwendete Film ein Ilford Pan F 16 mm Negativfilm 23° Sch. fine grain.

Für die Beleuchtung wurde eine lichtstarke Kohlenbogenlampe verwendet. Wie Fig. 1 und 2 zeigen, war die Apparataufstellung so ein-

*) Die Agaroberfläche ist nicht ganz glatt. Es wäre vielleicht besser gewesen, wenn die Agaroberfläche gegen das Objektiv gerichtet wäre, von diesem nur von einer dünnen Luftschicht, Deckglas und Immersionsöl geschieden. Aber es gelang nicht, die Sporenabschleuderung in dieser Weise zu filmen, weil sich immer Tautropfen auf der Unterseite des obersten Deckglasses bildeten. Alle Versuche, z.B. mit Silicon, diesem Tau zu entgehen, versagten.



1 2

Fig. 1 und 2. Die Apparataufstellung. Fig. 2 zeigt, wie man durch einen Hebeldruck die Filmung im Gange setzt.

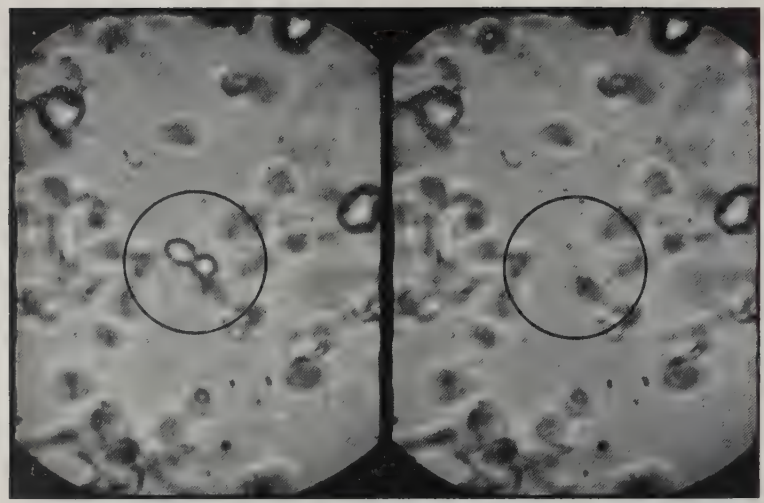
gerichtet, dass durch einen einzigen Hebeldruck gleichzeitig 3 verschiedene Änderungen hervorgerufen werden konnten (man bedenke, dass zwischen der ersten Wahrnehmung des Tropfens und bis zur Abschleuderung der Sporen nur 7 Sekunden vergehen): a) Der Filmapparat wurde in Gang gesetzt, b) Das stark lichtabsorbierende Glas zwischen Bogenlampe und Mikroskop wurde beseitigt, c) Der Seitentubus wurde mit einer Blende gedeckt, so dass der Beobachter auch während des Filmens die Kultur beobachten konnte.

In allem gelang es 14 Sporenabschleuderungen zu filmen. Dem Film sind die Aufnahmen kurz vor und kurz nach der Sporenabschleuderung entnommen. Fig. 3 und 4 (Taf. 1)*) zeigen nun zuerst dieselbe reife Spore von *Sporobolomyces salmonicolor,* bei verschiedener Einstellung des Mikroskopes. In Fig. 3 sieht man, dass das Sterigma an der Spitze wahrscheinlich eine ganz enge Öffnung von ungefähr 0,3 μ im Diameter hat. Die Spore ist ca. 8×4 μ.

*) Keine von den Photographien der Tafeln sind retouchiert worden.

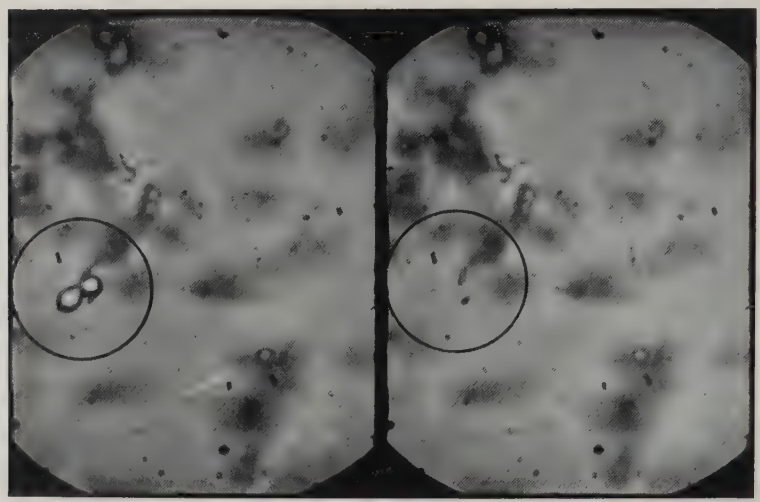
Fig. 3. *Sporobolomyces salmonicolor*. 3000 x.

Fig. 4. *Sporobolomyces salmonicolor*. 3000 x.



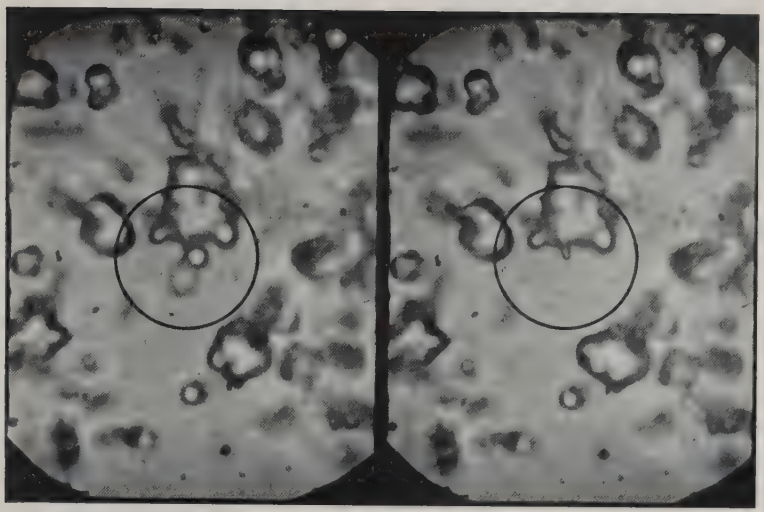
a b

Fig. 5 a und b. *Sporobolomyces salmonicolor*. Im Bild a sind Spore und Tropfen deutlich zu erkennen, während im Bild b, 1/64 Sekunde später, beide dem Blickfeld entschwunden sind. 900 x.



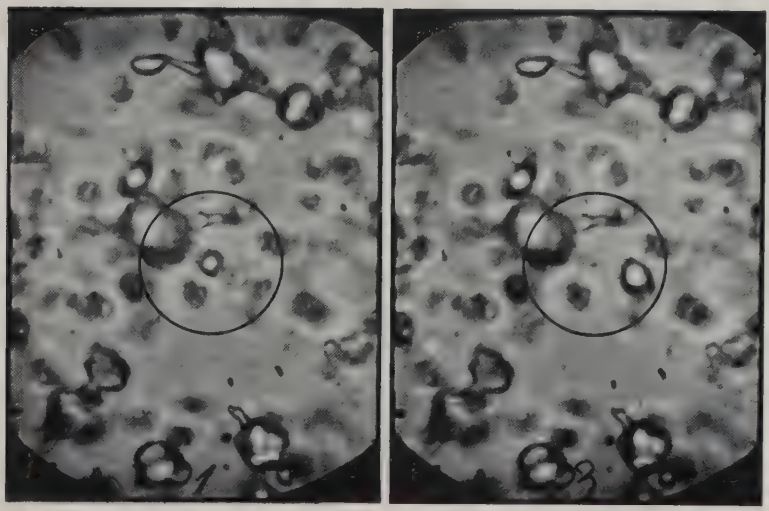
a b

Fig. 6 a und b. *Sporobolomyces salmonicolor*. Im Bild a sind Spore und Tropfen deutlich zu erkennen, während im Bild b, 1/64 Sekunde später, beide dem Blickfeld entschwunden sind. 900 x.



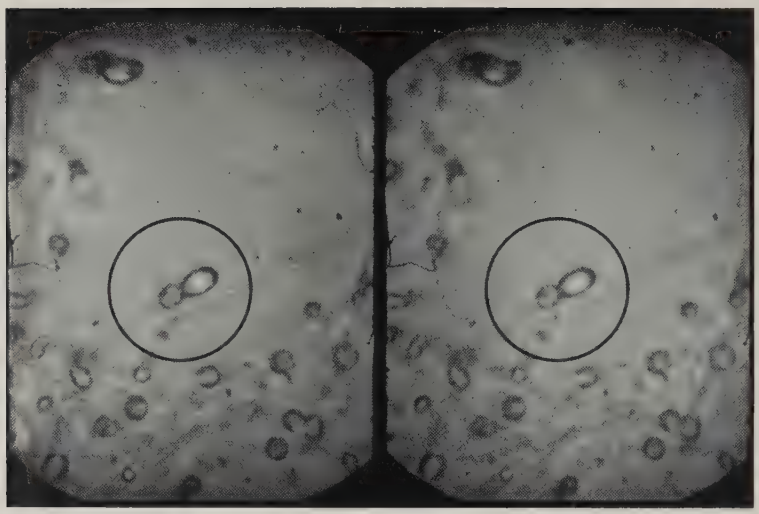
a b

Fig. 7 a und b. *Sporobolomyces salmonicolor*. Im Bild a sind Spore und Tropfen deutlich zu erkennen, während im Bild b, 1/64 Sekunde später, beide dem Blickfeld entschwunden sind. 900 x.



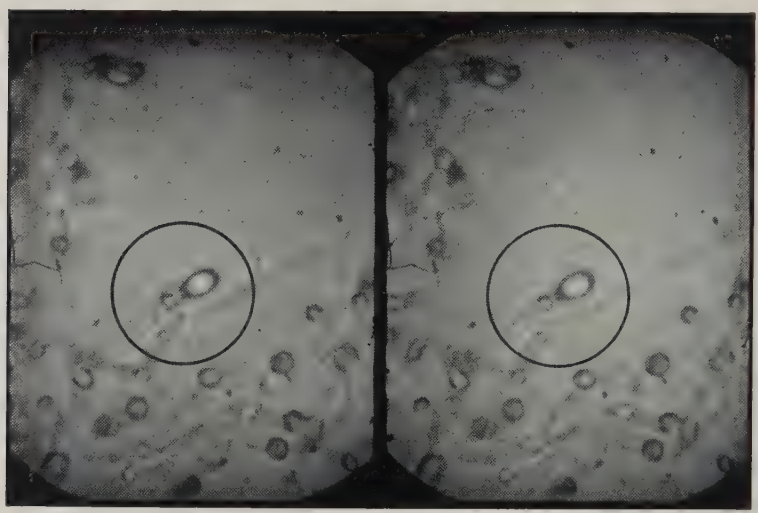
a b

Fig. 8 a und b. *Sporobolomyces salmonicolor*. In a ist der Tropfen deutlich, die Spore undeutlich zu sehen. In b sieht man die im Tropfen gehüllte Spore 4 mm rechts von der Sterigmaspitze. 900 x.



a b

Fig. 9 a und b. *Sporobolomyces salmonicolor.* Spore und Tropfen 28/64 und 27/64 Sekunde vor der Abschleuderung. 900 x.



c d

Fig. 9 c und d. *Sporobolomyces salmonicolor.* In c, 1/64 Sekunde vor der Abschleuderung, ist der Tropfen undeutlich. In d ist der Tropfen weg. Fig. 9 c bis d zeigen, dass der Tropfen ohne die Spore abgeschleudert wird. 900 x.

Die folgenden Bilder Fig. 5 a und b (Taf. 2), Fig. 6 a und b (Taf. 2) u.s.w. inclusive Fig. 9 a, b, c und d sind in einer Bildfolge von $^1/_{64}$ Sekunde aufgenommen worden. Im Bild a sind Spore und Tropfen deutlich zu erkennen, während im Bild b — $^1/_{64}$ Sekunde später — beide dem Blickfeld entschwunden sind.

Es sei noch besonders auf Fig. 8 und 9 (Taf. 3 und 4) aufmerksam gemacht. In Fig. 8 a ist der Tropfen deutlich, die Spore undeutlich zu sehen. In Fig. 8 b sieht man die in den Tropfen gehüllte Spore 4 mm rechts von der Sterigmaspitze

Noch bemerkenswerter sind Fig. 9 a, b, c und d (Taf. 4). Fig 9 a zeigt Spore und Tropfen $^{28}/_{64}$ Sekunde vor der Abschleuderung. Fig. 9 b zeigt Spore und Tropfen $^{27}/_{64}$ Sekunde vor und Fig. 9 c zeigt Spore und — undeutlich — den Tropfen $^1/_{64}$ Sekunde vor der Abschleuderung. In Fig. 9 d ist nur die Spore sichtbar. Das heisst n u r d e r T r o p f e n w u r d e a b g e s c h l e u d e r t — während die Spore von dem abgeschleuderten Tropfen nicht mitgerissen wurde und darum sitzen blieb.

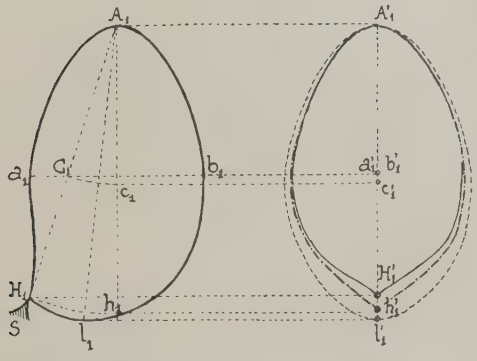


Fig. 10. Skitze einer Spore, von der Seite und frontal gesehen. H_1 Hilum und S Sterigma. Nach H e i m 1931.

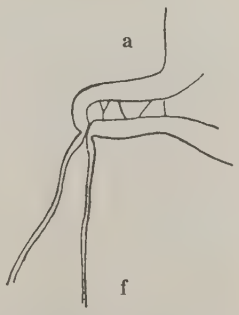


Fig. 11. Die Verbindung Sterigma-Spore, d. h. die Verbindung Funiculus (f)- Apiculus (a), bei *Russula*. Nach L o c q u i n 1948.

Zur Erläuterung des Tropfenmechanismus sei noch Fig. 10 bis 12 wiedergegeben. Fig. 10 zeigt die Verbindung Sterigma-Spore so wie sie H e i m (1931) gezeichnet hat. Fig. 11 zeigt die Verbindung Sterigma-Spore nach L o c q u i n (1948). Fig. 12 zeigt wie P r i n c e (1943) sich den Mechanismus der Sporenabschleuderung durch Ausstülpung denkt.

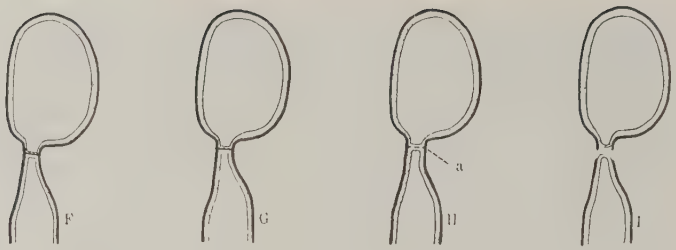


Fig. 12. Die Bilder zeigen, wie die Spore von *Gymnosporangium* nach der Ausstülpungstheorie abgeschleudert wird. Nach Prince 1943.

Wenn wir nun die treibenden Kräfte des Tropfenmechanismus näher analysieren wollen, müssen wir erst die bisher aufgestellten Theorien über den Wirkungsmodus des Tropfenmechanismus betrachten. Es sind vier Theorien: 1. Die Spritztheorie, 2. Die Ausstülpungstheorie, 3. Die Theorie der Oberflächenenergie und 4. Die Theorie der Gleichgewichtsstörung.

1. Die Spritztheorie (Squirting mechanism). *Brefeld* (1877), *Zalewski* (1883, p. 266) und *Dietel* (1912) meinen, dass die Basidiosporen durch Bersten und Ausspritzen abgeschleudert werden, ähnlich also wie die Sporenabschleuderung bei vielen Ascomyceten und bei *Pilobolus*. Aber namentlich *Buller* (1909 und 1922) hat hervorgehoben, dass der Tropfenmechanismus nicht ein Spritzmechanismus ist. Auch die Filmbilder von *Sporobolomyces* zeigen, dass ein Ausspritzen, so wie es von den Ascomyceten bekannt ist, nicht stattfindet.

2. Die Ausstülpungstheorie (Rounding-off theory). Nach dieser Theorie geschieht die Abschleuderung der Sporen dadurch, dass sich die Spitze des Sterigmas wegen des Turgordruckes plötzlich abrundet oder besser gesagt ausstülpt (Fig. 12). Ein solcher Ausstülpungsmechanismus ist bei der Sporenabschleuderung der Phycomyceten *Entomophthora* und *Sclerospora* wirksam. Buller (1909) war der erste, der die Abschleuderung der Basidiosporen mit einer Ausstülpung in Verbindung setzte. Später gab Buller (1915, 1922) die Ausstülpungstheorie auf. In neuester Zeit ist sie aber wieder von Greis (1943) und Prince (1943) aufgegriffen worden. Dieser Theorie entsprechend hat der Tropfen am Hilum also nichts mit der Abschleuderung zu tun, es sei denn, dass der Tropfen vielleicht die Verbindungsstelle Sterigma-Hilum erweicht. So schreibt

Greis (l. c. p. 72): „Der Zusammenhang Sporenabschleuderung-Tropfen wäre demnach so zu erklären: Unterbleibt die Ausbildung des Flüssigkeitstropfens, so besagt dies, dass der Turgor der Basidie zu klein ist und daher auch die Spore nicht abgeschleudert werden kann; erscheint dagegen ein Tropfen, sei es am Hilum der Spore oder am Isthmus des Sterigmas, so besagt dies, dass der Turgor in der Basidie so hoch geworden ist, dass das Sterigma am Isthmus aufgerissen ist und es zur Abschleuderung der Spore kommen muss. So ist die Tropfenausscheidung nicht eine Ursache für die Sporenabschleuderung, sondern eine Begleiterscheinung". Prince arbeitete mit *Gymnosporangium nidus-avis*. Er hat als erster den Tropfen, der sich 5 bis 15 Sekunden vor der Sporenabschleuderung bildet, photographiert. Auf Basis seiner Beobachtungen meint Prince, dass die Ausstülpungstheorie die richtige ist, und er gibt dazu die schematische Zeichnung, die in Fig. 12 wiedergegeben ist. In seinem neuesten Buch (1953) schliesst sich auch Ingold, insbesonders von der Abhandlung Prince's beeinflusst, der Ausstülpungstheorie an.

3. Theorie der Oberflächenenergie des Tropfens. Ingold hat im Jahre 1939 die Hypothese erwogen, dass die bei dem Ausbreiten des Tropfens über die Spore plötzliche Verminderung der Oberflächenenergie in irgend einer Weise die treibende Kraft der Abschleuderung ist. Er schliesst sich jedoch wie erwähnt in seinem neuesten Buch der Ausstülpungstheorie an.

4. Die Theorie der Gleichgewichtsstörung, von Lohwag (1938, 1941) aufgestellt, wird auch von Locquin (1948) vertreten. Lohwag schreibt (1938, p. 184): „Am Ende des kürzeren Armes (also am Hilum) wird nun ein Tropfen abgeschieden. Sein Gewicht wirkt sich auf die Stellung des Hebels (Spore) aus, und diese Wirkung steigert sich mit der Vergrösserung der Spore bis es zum Abreissen an der „schwachen" Sterigma-Spitze kommt. Durch den Innendruck der Basidie wird nun die Spore abgeschleudert, ohne dass der Tropfen selbst in Mitleidenschaft gezogen wird". Ganz ähnlich schreibt Lohwag (1941, p. 457), und Locquin (1948, p. 16) schreibt: „La gouttelette suprahilaire vient à point pour déplacer le centre de gravité de la spore et provoquer sa projection suivant l'axe de la baside".

Von den 4 Theorien sollen nur die Ausstülpungstheorie (2) und die Theorie der Gleichgewichtsstörung (4) näher besprochen werden. Schwerwiegende Einwände können gegen die Ausstülpungstheorie

angeführt werden. Erstens ist Isthmus des Sterigmas sehr dünn. Zweitens existiert die für die Ausstülpung notwendige Dobbelwand zwischen Spore und Sterigmaspitze nicht. Drittens: Die Ausstülpungstheorie lässt allein von allen Theorien den Tropfen unbeachtet. Aber — wer öfters die Sporenabschleuderung der Basidiomyceten beobachtet hat, ist überzeugt, dass zwischen Sporenabschleuderung und Tropfen ein enger Zusammenhang herrscht. Darum gab auch Buller die Ausstülpungstheorie auf. Ebenso schwerwiegende Einwände können gegen die Gleichgewichtstheorie hervorgebracht werden. Der Tropfen hat bei einem Diameter von 3 μ ein Gewicht von der Grössenordnung 0,013 mγ (13×10^{-9} mg). Bei solch geringen Gewichten spielt die Schwerkraft und somit die Gewichtsverschiebung überhaupt keine Rolle.

Ich sah zum ersten Male am 29. Nov. 1946 bei *Coprinus radiatus*, dass der Tropfen abgeschleudert werden kann, ohne die Spore mit zu reissen! Der Tropfen wird also mit einer gewissen Kraft, von der turgescenten Basidie herrührend, abgeschossen. Gewöhnlich trifft der Schuss die Spore, und Tropfen und Spore werden dann zusammen abgeschleudert. Recht oft ist die Kraft des abgeschossenen Tropfens nicht gross genug, um die Spore abzuschleudern — dann verbleibt die Spore mit dem Tropfen auf dem Sterigma. In seltenen Fällen trifft der Tropfen nicht, und die Spore bleibt sitzen. In den Bildern Fig. 9 a, b, c und d sieht man, wie der Tropfen weggeschossen wird, ohne die Spore zu treffen.

Die Basidiomyceten sind in Bezug auf Hauptsporenbildung spezialisierte Ascomyceten, und die Sporenabschleuderung durch den Tropfenmechanismus ist ein spezialisierter Spritzmechanismus.

ZUSAMMENFASSUNG

Von den Basidiomyceten *Sporobolomyces salmonicolor* (F. et Br.) Kl. et v. N. werden die Sporen durch den Tropfenmechanismus abgeschleudert. Die Sporenabschleuderung wurde gefilmt, teils mit 24 Aufnahmen pro Sekunde und eine Vergrösserung von 300 x, teils mit 64 Aufnahmen pro Sekunde und eine Vergrösserung von 1200 x. Die Technik des Filmens wird geschildert. Von den Aufnahmen sind in Fig. 5 bis Fig. 9 die Aufnahmen kurz vor und kurz nach der Abschleuderung der Sporen wiedergegeben.

Der Tropfenmechanismus fungiert in der Weise, dass der Tropfen mit einer gewissen Kraft abgeschossen wird. Gewöhnlich trifft er die Spore und reisst diese mit. Der Tropfenmechanismus ist ein stark spezialisierter Spritzmechanismus.

Herr A. Øye hat mit unermüdlicher Geduld und mit grossem technischen Können die Schwierigkeiten bei der Filmung überwunden. Seit wir in 1946 mit den Aufnahmen der Sporenabschleuderung von Coprinus anfingen, hat Herr Øye die Apparatur verbessert bis es endlich gelang. Herr Amanuensis E. Bille-Hansen hat die Sporobolomyces kultiviert und dabei mit besonderem Geschick die Kulturen so hergestellt, dass das Filmen möglich wurde. Ich danke Herrn Øye und Herrn Bille-Hansen herzlich für ihre unentbehrliche Mitarbeit. — Statens Almindelige Videnskabsfond hat die Verfilmung unterstützt, und ich möchte auch hier meinen Dank dafür aussprechen.

LITERATUR

Brefeld, O.: Botanische Untersuchungen über Schimmelpilze. III. Basidiomycetes I. 1877.

Buchwald, N. F.: On the size of spore-production of the Tinder Fungus, Polyporus fomentarius (L) Fr. Friesia 2: 42—69. 1938.

Buller, A.: Researches on fungi. 1909.

— Die Erzeugung und Befreiung der Sporen bei Coprinus sterquilinus. Jb. wiss. Bot. 56: 299—329. 1915.

— Researches on fungi. II. 1922.

— Researches on fungi. III. 1924.

— Researches on fungi. V. 1933.

Dietel, P.: Über die Abschleuderung der Sporidien bei den Uredineen. Mycol. Centralbl. 1: 355—359. 1912.

Fayod, V.: Prodrome d'une Histoire des Agaricinés. Ann. Sci. Sér. 7., 9: 181—411. 1889.

Greis, H.: Bau, Entwicklung und Lebensweise der Pilze. Die natürl. Pflanzenfamilien Bd. 5a I. 1943.

Heim, R.: Le genre Inocybe. 1931.

Ingold, C.: Spore discharge in land plants. Oxford 1939.

— Dispersal in fungi. Oxford 1953.

Kluyver, A. & C. v. Niel: Über Spiegelbilder erzeugende Hefearten und die neue Hefengattung Sporobolomyces. Centralbl. Bakt. II, 63: 1—20. 1925.

Lohwag, H.: Zur Abschleuderung der Basidiosporen unter Tropfenabscheidung. Rev. Mycol. 3: 179—186. 1938.

— Anatomie der Asco- und Basidiomyceten. Hdb. d. Pflanzenanatomie 6, Abt. 2, Teilb. 3, C. 1941.

Locquin, M.: Morphologie et structure des spores de Russula. Rev. Myc. **13:** 10—29. 1948.

Prince, A.: Basidium formation and spore discharge in Gymnosporangium nidus-avis. Farlowia 1: 79—93. 1943.

Zalewski, A.: Über Sporenabschnürung und Sporenabfallen bei den Pilzen. Flora 66: 268—270. 1883.

Kopenhagen, Juni 1954.

A METHOD FOR THE STUDY OF MYCELIAL ANASTOMOSES

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Contribution No. 43.

INTRODUCTION

In work with wood-destroying fungi the identification of isolated non-fructifying mycelia presents an unavoidable problem. To solve this problem an extensive collection of cultures consisting of mycelial cultures isolated from fruit bodies determined with certainty is necessary. The work with the collection of cultures as such provides a certain basis for the ability to identify isolated cultures, since gradually one learns to recognize the appearance of a large number of fungi in culture, thus often allowing an immediate conjecture as to the species in question. Simultaneously, the collection of cultures provides the material for the comparison necessary for a precise determination.

In addition to the collection of cultures a series of descriptions of the cultural and anatomical characters of a large number of the wood-inhabiting fungi may assist in the identification. Among these are the works of Cartwright & Findlay (1946), and Nobles (1948). The latter gives, in addition to detailed descriptions, a key for the determination of a considerable number of wood-destroying fungi based on the characters mentioned.

The practical use of such descriptions and keys is extremely difficult. So difficult in fact, that the result obtained through the

use of the key, as well as a determination deduced any other way, should always be checked by a comparison with a culture determined with certainty.

The comparison may comprise anatomical as well as physiological characters. Part of the comparison should undoubtedly consist of a confrontation of the mycelia to demonstrate possible anastomosing, since anastomosing between diploid mycelia according to Cabral (1951) may be taken to mean that they belong to the same distinct species. On the other hand, the absence of anastomosing between two mycelia does not necessarily mean that they belong to two different species. Thus the investigations of Robak (1942) and Cabral (1951) showed that it was not always possible to demonstrate anastomosing between the diploid mycelia in isolates of fruit bodies from the same species.

In spite of this fact it will be possible in many cases to determine a species far more rapidly by examining the formation of anastomoses than it would be by making anatomical or physiological comparisons, which often require rather extensive and time consuming work in the laboratory.

MATING OF MYCELIA

The mating of two mycelia should take place in such a way as to allow, by observing a possible formation of anastomoses, a precise determination of whether it is a formation of anastomoses between hyphae from both mycelia, or between hyphae from a single one of the mycelia only. Mating the mycelia in Petri dishes is not suitable for the demonstration of the formation of anastomoses as the necessary overall view is lost. The mating should take place actually under the objective of the microscope, i. e., on the glass slide.

Buller (1933), studying formation of anastomoses in general, as well as Robak (1942) and Cabral (1951), both working on the mating of diploid mycelia of wood-destroying fungi in particular, all used methods involving different kinds of moist cells (van Tieghem cells). The mycelia were transferred by means of small cut-out pieces to the lower side of the cover slide in such a way that the mycelia were separated to a distance of 2 to 4 mm.

However, the oil cells described in the following offer several advantages as compared to the moist cell. Among the more important ones are:

1) The oil cell seems to be impervious to contamination with foreign organisms in spite of the fact that no sterile precautions are taken by the preparation.

2) The preparations may be kept in the room without danger of drying out even if no special precautions are taken. Thus formation of anastomoses may be observed even in one year old preparations.

3) The oil cell can be prepared very quickly.

4) The oil cell is well suited for microscopy and photography because of the refraction of the liquid paraffin. (Cp. the accompanying photographs of the formation of anastomoses between two isolates of *Fomes annosus* (Fr.) Cke. (Figs. 1—3)).

PREPARATION OF OIL CELLS FOR STUDYING THE FORMATION OF ANASTOMOSES

A) Materials.

1) Liquid paraffin, very pure and with low viscosity; this oil is full of microscopic air bubbles and does not contain fungicides.
2) Glass slides, hollow ground, and cover slides, the usual standard size glass slide (76×26×1,5 mm) with a circular or oval concave depression in the center. The major axis of the concave depression is about 16 mm, and the depth at the center is 0,5 mm. Cover slides of 40×25×0,1 mm should be used for ample covering of the concave depression.
3) Mycelial cultures of 2 per cent. P.D.A. (potato dextrose agar) in Petri dishes.

B) Preparation.

Glass slides and cover slides should be meticulously cleaned. From the agar cultures two square pieces with a side length of about 2 to 3 mm and a depth of about 0.5 mm are cut out. These pieces, on which the mycelium must be intact, are placed in the concave depression separated to a distance of 4 to 5 mm.

By means of a pipette the cut-out pieces are covered with liquid paraffin in such a way that the oil fills up the whole concave depression and is arched over the agar pieces. Finally the cover slide is placed in the usual way, thus causing the oil to spread beyond the edge of the concave depression, whereby cover slide and agar pieces are fixed.

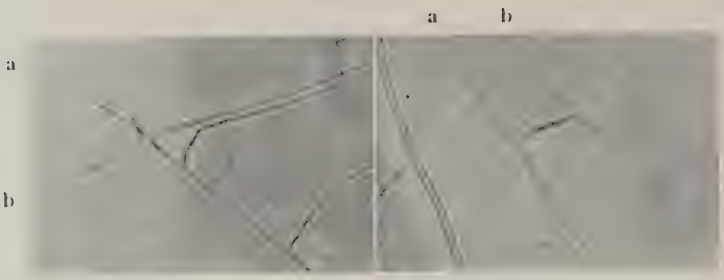

Fig. 1. × 170. Fig. 2. × 170.

Fig. 3. × 450.

Figs. 1, 2, and 3. The photographs show formation of anastomoses between two different isolates of *Fomes annosus* (Fr.) Cke., photographed 3 days after transfer to oil cell. The isolates are the following:

a. Culture no. 1052, isolated during November, 1951, from *Pinus silvestris*, Stockholm, Sweden.

b. Culture no. 1104, isolated during December, 1953, from *Picea sitchensis*, Studsgaard, Jutland, Denmark.

Note the formation of clamp connections in Fig. 3.

SUMMARY

In work with wood-destroying fungi sterile mycelia are often isolated, which cannot be identified without extensive studies of the anatomical and physiological properties of the isolates. As part of this identification the unidentified mycelia should be confronted with mycelia of known species of the same type, whereby possible anastomosing between the mycelia may be observed. The formation of anastomoses between two mycelia may be taken as an indication that the mycelia belong to the same species. In the present paper an oil cell method is described, which has proved suitable for studying formation of anastomoses between two mycelia.

REFERENCES

Buller, A. H. R.: Researches on Fungi. V. London 1933.

Cabral, Ráúl Vasco de Garcia: Anastomoses Miceliais. Boletim da Sociedade Broteriana 25:291. 1951.

Cartwright, K. St. G. & Findlay, W. P. K.: Decay of Timber and its Prevention. Forest Products Research Laboratory. 1946.

Nobles, Mildred K.: Identification of Wood-Rotting Fungi. Canad. Journ. Research C, 26: 281—431. 1948.

Robak, H.: Cultural Studies in some Norwegian Wood-Destroying Fungi. Medd. Nr. 25 fra Vestlandets forst. Forsøksstation. Bergen 1942.

Copenhagen, June 1954.

SPECIES OF HELMINTHOSPORIUM ON CEREALS AND GRASSES IN DENMARK

By HENNING ANDERSEN
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Since the publication of F. K ø l p i n R a v n's comprehensive book on *Helminthosporium* on barley and oat (1900), this important genus has not been thoroughly investigated in Denmark.

The present survey is an attempt to establish the occurrence of species of *Helminthosporium* on *Gramineae* in Denmark. It is based on the authors investigations of collected material of infected plants and on data accumulated during his examinations of grass seeds (A n d e r s e n 1952, 1953)*. Measurements are based on at least 25 conidia, often 50, sometimes 100 and more conidia. In the identification of the species the descriptions in the monograph by C. D r e c h s l e r (1923) has been used.

KEY TO THE SPECIES OF *HELMINTHOSPORIUM* ON *GRAMINEAE* IN DENMARK

A. Conidia ellipsoid to fusoid, germinating by polar germ tubes. Perfect stage, when known, *Cochliobolus* (Syn. *Ophiobolus*). ..... A. *Eu-Helminthosporium.*

Conidia ellipsoid to fusoid, often curved, brown to dark brown, macroscopically black, 24—101 × 14—34 μ, 1—11 septa. Causing leaf spots on cereals and grasses ..... 1. *H. sativum.*

*) A part of this material is kept at the Phytopathological Department of the Royal Veterinary and Agricultural College, Copenhagen.

B. Conidia cylindric or subcylindric. Perfect stage, when known, *Pyrenophora (Pleospora)* ..... B. *Cylindro-Helminthosporium.*

I. Conidia cylindric.

a. Conidia large, maximum length over 200 μ, light yellow-brown to ligth olivaceous, 84—223×12—22 μ, 1—10 septa. On *Bromus* spp. ..... 2. *H. bromi.*

b. Conidia never exceeding the length of 200 μ.

1. Conidial wall thick.

a) Conidia sometimes flask-shaped, olivaceous, 48—156 ×12—20 μ, 1—9 septa. On *Avena sativa* ..... 3. *H. avenae.*

b) Conidia light olivaceous to olivaceous, 24—156× 10—21 μ, 1—8 septa. On *Hordeum sativum.* ..... 4. *H. gramineum.*

2. Conidial wall thin.

Conidia sometimes slightly constricted at the septa, at least at the basal septum, light olivaceous to olivaceous, 41—125×11—20 μ, 1—7 septa. On *Hordeum sativum.* ..... 5. *H. teres.*

II. Conidia cylindric to obclavate.

a. Basal cell of the conidium tapering, light olivaceous, 96—180×11—24 μ, 1—9 septa. On *Agropyrum repens* ..... 6. *H. tritici-repentis.*

b. Basal cell of the conidium n o t tapering, yellow to light brown, 36—187×9—23 μ, 1—9 septa. On *Dactylis, Festuca, Lolium, Phleum* and *Poa* spp. ..... 7. *H. siccans.*

III. Conidia obovate.

Light brownish to brownish; 18—37×9—17 μ; 1—4 septa. On *Dactylis* and *Festuca duriuscula* ... 8. *H. dematioideum.*

SPECIFIC DESCRIPTIONS AND NOTES

1. **Helminthosporium sativum** Pammel, King & Bakke (1910).

C o n i d i o p h o r e s. Appearing singly or in groups of 2 or 3, often geniculated and with many conidial scars. The basal cell some-

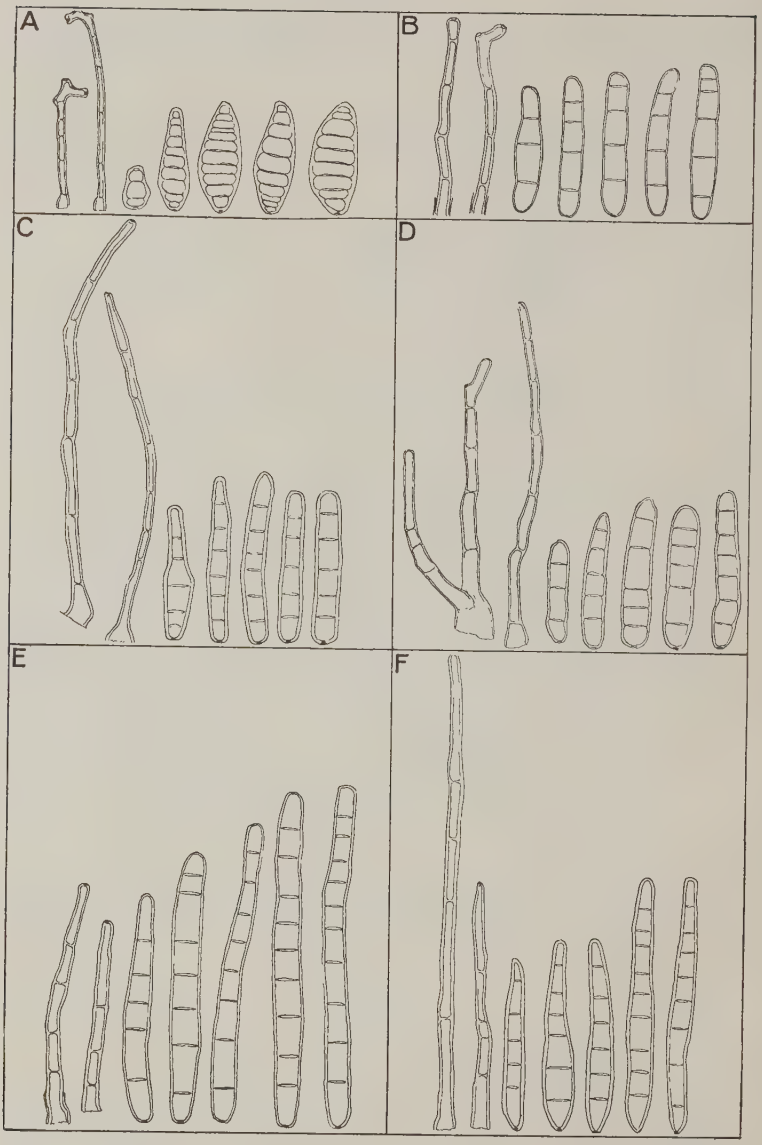

Fig. 1. Conidiophores and conidia of various species of *Helminthosporium*. A: *H. sativum;* B: *H. teres;* C: *H. avenae;* D: *H. gramineum;* E: *H. bromi;* F: *H. tritici-repentis.* — ×250.

times swollen. Proliferations occur. Lighter in colour than the conidia. 3—8 septa. 74—175×5—7 μ.

Conidia. Ellipsoid, rhomboid to slightly fusoid, rather variable in shape; brown to dark brown, macroscopically almost black. Conidial wall very thick: 1,0—1,2 μ. Hilum conspicuous. 24—101×14—34 μ. Average: 68,4×20,9 μ (100 measurements). 1—11 septa. Germinating only by polar germ tubes.

Perfect stage. *Cochliobolus (Ophiobolus) sativus* (Ito & Kuribayashi) Drechsl. fide Dickson (1947) (Sprague 1950).

Occurrence in Denmark.

Plants. *Agropyrum repens* (Stensgaards Alle, Lyngby 29.6. 1954!*)) — *Festuca pratensis* (Albertslund, Glostrup 16.7.1951! Havesbjerggaard, Hedehusene 13.8.1952!). — *Hordeum sativum* (Havesbjerggaard, Hedehusene 13.7.1954!). — *Lolium multiflorum, Lolium perenne* (Albertslund, Glostrup 16.7.1951!).

Seeds. *Avena sativa, Dactylis glomerata, Festuca pratensis, Festuca rubra, Hordeum sativum, Lolium multiflorum, Triticum vulgare* (Andersen 1952, 1953).

Very common. *Helminthosporium sativum* has not previously been reported in Denmark. — Causing leaf spots.

2. **Helminthosporium bromi** Died. (1903).

Conidiophores. Appearing singly, or rarely in pairs with only one conidium. The apex straight with one rather distinct conidial scar. The basal cell swollen. 2—6 septa. 144—221×7—12 μ. Conidiophores characterized by distinct proliferations.

Conidia. Cylindric, straight, rarely curved or irregularly bended. Conidia light brown to brown olivaceous. Conidial walls thin: 0,4—0,5 μ. Hilum not very conspicuous. 84—223×12—22 μ. Average: 160×16,3 μ (50 measurements). 1—10 septa. Germination from all cells.

Perfect stage. *Pyrenophora bromi* (Died.) Drechsl. (1923); Syn. *Pleospora bromi* Died. (1903).

Occurrence in Denmark.

Plants. *Bromus arvensis* (Albertslund, Glostrup 4.6.1951!).

*) ! means »found by the author«.

Seeds. *Bromus arvensis* (1948!).

Not common. *Helminthosporium bromi* has not previously been reported in Denmark. — Causing leaf spots.

3. **Helminthosporium avenae** Eidam (1891).

Conidiophores. Arising singly, or rarely in pairs, with one or more conidia. Often geniculated towards the apex, the apex provided with conidial scars, the basal cell swollen. 7—12 septa. 108—383×7—10 μ.

Conidia. Cylindric, subcylindric to obclavate, straight or rarely irregularly curved, flask-shaped conidia may occur; olivaceous. Conidial wall thick: 0,8—1,0 μ. Hilum distinct. 48—156×12—20 μ. Average: 80,0×15,8 μ (50 measurements). 1—9 septa. Germination from the end cells, frequently from the apical cell. Germ tubes from the other cells may occur too.

Perfect stage. *Pyrenophora avenae* Ito & Kuribayashi (1931).

Occurrence in Denmark.

Plants. *Avena sativa* (Ragensminde, Glostrup and many other localities, F. K. Ravn 11.10.1896; Hvissinge, Glostrup 29.8.1952! Ejby, Skovlunde, Herstedøster June 1953 and 1954!).

Seeds. *Avena sativa* (Andersen 1952, 1953).

Helminthosporium avenae is very common, but has been overlooked. — Causing leaf blotch of oats.

4. **Helminthosporium gramineum** Rabh (1856).

Conidiophores. Arising singly, or in pairs, each producing one or more conidia. Chains of two or three conidia may occur. The apex often geniculated and provided with conidial scars. The basal cell more or less hemispherically swollen. 1—8 septa. 67—230×7—12 μ.

Conidia. Cylindric, subcylindric to obclavate, light olivaceous to olivaceous. Conidial walls thick: 0,8—1,0 μ. Hilum conspicuous. The apical cell sometimes provided with scars from secondary conidia. 24—156×10—21 μ. Average: 76,5×13,9 μ (50 measurements).

1—8 septa. Germination from all cells, but frequently from the end cells.

Perfect stage. *Pyrenophora graminea* Ito & Kuribayashi (1931).

Occurrence in Denmark.

Plants. *Hordeum sativum* (E. Rostrup 1888; Statens plantepatologiske Forsøg, Lyngby 1954! Ullerup 19.9.1954!).

Due to extensive use of seed desinfectants *Helminthosporium gramineum* is now very rare in Denmark. — Causing stripe of barley.

5. **Helminthosporium teres** Sacc. (1882).

Conidiophores. Arising singly, or in groups of 2 or 3, geniculated towards the apex. The basal cell swollen. One or more conidia. 91—192×7—9 μ.

Conidia. Cylindric to slight obclavate, constricted at the basal septum, rarely constricted at the other septa; light olivaceous to olivaceous. Conidial wall thin: 0,5—0,6 μ. 41—125×11—20 μ. Average: 88,3×16,1 μ (50 measurements). 1—7 septa. Germination by production of germ tubes from the end cells, rarely from the other cells.

Perfect stage. *Pyrenophora teres* (Died.) Drechsl. (1923); Syn. *Pleospora teres* Died. 1903.

Occurrence in Denmark.

Plants. *Hordeum sativum* (E. Rostrup 1888; Ruds-Vedby 20.8. 1953!).

Seeds. *Hordeum sativum* (F. Kølpin Ravn 1899).

Due to extensive use of seed desinfectants *Helminthosporium teres* is now very rare in Denmark. — Causing net blotch and leaf spots of barley.

6. **Helminthosporium tritici-repentis** Died. (1902).

Conidiophores. Arising singly or in pairs, with one or more conidia. The basal cell somewhat swollen. Geniculations not pronounced. 6—7 septa. 104—221×5—7 μ.

Conidia. Cylindric to obclavate, straight, rarely more and less irregularly curved, with a caracteristic tapering basal cell; light olivaceous. Conidial wall thick: 0,8—1,0 μ. 96—180×11—24 μ. Average: 138,9×16,8 μ (25 measurements). 1—9 septa. Germinations from all cells, but seldom with more than 2 germ tubes.

Perfect stage. *Pyrenophora tritici-repentis* (Died.) Drechsl. (1923); Syn. *Pleospora tritici-repentis* Died. (1903).

Occurrence in Denmark.

Plants. *Agropyrum repens* (Stengaards Alle, Lyngby 18.7.1952! 29.6.1954!).

Helminthosporium tritici-repentis has not previously been reported in Denmark.

7a. **Helminthosporium siccans** Drechsl. (1923).

Monosporous type.*)

Conidiophores. Arising singly, rarely in pairs or in groups of three, with rarely two or three conidia. Chains of two or three conidia may occur. Conidiophores with only one conidial scar. The basal cell swollen. 2—12 septa. 65—336×7—8 μ.

Conidia. Typically obclavate, rarely subcylindric, straight, but irregularly curved conidia may occur. Yellow to light brown. Conidial wall thick: 0,8—1,0 μ. Hilum conspicuous. The apical cell sometimes provided with a scar from secondary conidium. 36—187×11—23 μ. Average: 91,9×14,8 μ (500 measurements). 1—9 septa. Germination from all cells, but frequently from the end cells.

Perfect stage. *Pyrenophora lolii* Dovaston (1948) fide Sprague (1950).

Occurrence in Denmark.

Plants. *Festuca pratensis* (Albertslund 10.6.1952!). *Lolium multiflorum* (Lyngby 16.7.1951!). *Lolium perenne* (Lyngby 16.7.1951!).

Seeds. *Festuca pratensis* (1948!). *Festuca rubra* (1949!). *Lolium multiflorum* (1949!). *Lolium perenne* (1949!). *Phleum pratense* (1951!). *Poa pratensis* (1950!). *Poa trivialis* (1950!) (Andersen 1952, 1953).

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*) Although the monosporous type is morphologically very similar to *Helminthosporium dictioides*, it is different from this species in some characters. A publication dealing with this matter is in preparaton.

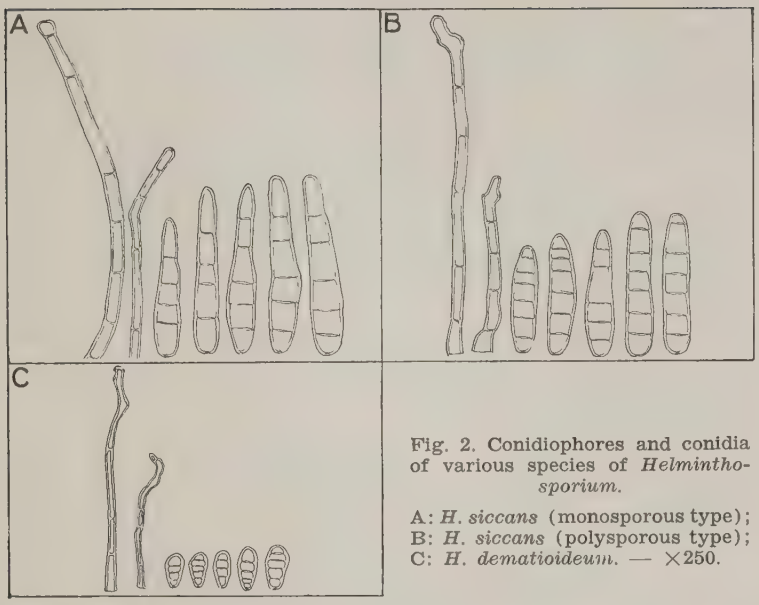

Fig. 2. Conidiophores and conidia of various species of *Helminthosporium*.

A: *H. siccans* (monosporous type); B: *H. siccans* (polysporous type); C: *H. dematioideum*. — ×250.

Helminthosporium siccans is very common, but has not previously been reported in Denmark. — Causing leaf spots and net blotch.

7b. **Helminthosporium siccans** Drechsl. (1923).

Polysporous type.

Conidiophores. Emerging singly, or rarely in pairs, with 1 to 20 conidia, generally about 10 conidia. The apex of the conidiophores provided with numerous conidial scars and well pronounced geniculations. The basal cell hemispherically swollen. 3—8 septa. 91—278 ×7—10 μ.

Conidia. Most commonly cylindric and straight, but slightly obclavate and clavate conidia occur. Conidia yellow to light brown. Conidial wall thick: 0,8—1,0 μ. 40—120×9—20 μ. Average: 69,3×14,2 μ (150 measurements). 1—8 septa. Germination from all cells, but frequently from the end cells.

Perfect stage. *Pyrenophora lolii* Dovaston (1948) fide Sprague (1950).

Occurrence in Denmark.

Plants. *Festuca pratensis* (Garden, Hellerup 20.7.1953!). *Lolium multiflorum* (Albertslund 10.6.1952!). *Lolium perenne* (Albertslund 20.8.1952!).

Seeds. *Dactylis glomerata* (1951!). *Festuca pratensis* (1948!). *Festuca rubra* (1950!). *Lolium multiflorum* (1949!). *Lolium perenne* (1949!). *Poa trivialis* (1950!). (Andersen 1952, 1953).

The polysporous type of *Helminthosporium siccans* is very common, but has not previously been reported in Denmark. — Causing leaf spots and net blotch.

8. **Helminthosporium dematioideum** Bubák & Wróblewski (1916) sensu Drechsler (1923).

Conidiophores. Geniculated towards the apex, with many conidial scars, frequently with proliferations. The basal cell of the conidiophores is not swollen, as it is by most *Helminthosporium* species. 3—6 septa. 62—158×5—6 μ.

Conidia. Obovate, light brown to brownish. Conidial wall very thick: 1—1,2 μ. Hilum conspicuous. 18—37×9—17 μ. Average: 28,0 ×13,0 (50 measurements). 1—4 septa. According to Drechsler (1923) the conidia germinate with one to three germ tubes from the basal cell.

Perfect stage. Unknown.

Occurrence in Denmark.

Plants. *Dactylis glomerata* (Garden, Hellerup 29.7.1954!).

Seeds. *Festuca duriuscula* (1951!) (Andersen 1953, p. 511).

Helminthosporium dematioideum has not previously been reported in Denmark.

ACKNOWLEDGMENTS

The author desires to express his most sincere thanks to dr. agro. Paul Neergaard and professor N. Fabritius Buchwald for much valuable advice and guidance during the elaboration of this paper.

REFERENCES

Andersen, Henning: Annual report from the Phytopathological Service of Denmark on seed-pathological testing. 1—3. — Tidsskr. f. Planteavl 56: 67—86. 1952.

— : Annual report from the Phytopathological Service of Denmark on seed-pathological testing. 4. — Tidsskr. f. Planteavl 56: 501—512. 1953.

Drechsler, Charles: Some graminicolous species of Helminthosporium. I. — Journ. Agr. Res. 24: 641—740. 1923.

Ravn, F. Kølpin: Nogle Helminthosporium-Arter og de af dem fremkaldte Sygdomme hos Byg og Havre. — Botan. Tidsskr. (København) 23: 101—321. 1900.

Sprague, Roderick: Diseases of cereals and grasses in North America. New York 1950.

Copenhagen, June 1954.

THE GENUS ENDOGONE IN DENMARK

By MORTEN LANGE
and ELSE MARGRETHE LUND

The genus *Endogone* has, like other genera of hypogean fungi, been almost neglected by Danish mycologists. The finds described here are, as far as we know, the first records of *Endogone* from Denmark. There is, on the other hand, no reason to believe that these peculiar *Phycomycetes* are rare here, and an extensive search will no doubt add more species to our flora. Our present knowledge of the genus is mainly due to the careful study by Bucholtz (1911) who demonstrated the zygomycetaceous nature of the species, finding either zygospore- or azygospore-formation in the various forms. Harkness (1899) had previously described a species with sporangia, which Kanouse (1936) removed to a new genus as *Modicella malleola* (Hark.) Kanouse. An extensive study of American species was published by Thaxter (1922). The determination of the species was greatly facilitated through the key published by Zycha (1935), including all well described taxa.

Endogonaceae is the only family among the *Phycomycetes* characterized by a distinct fruit body which, however, is of a rather loose texture, with a scanty peridium and a gleba made up of spores in a loose weft of hyphae. The species are found under the leaves or more or less deeply immersed in the soil. Almost all collections recorded here are from rich clay soil, but other species are said to grow among *Sphagnum*.

The species described below have either zygospores or azygospores, and belong to the genus *Endogone* in its restricted sense. They were found by the senior author on various excursions during 1951—

1952, and were included in the authors' joint studies on some Danish *Phycomycetes,* carried out with help of a grant from „Statens Almindelige Videnskabsfond".

Endogone macrocarpa Tulasne

Fig. 1.

Fruit body subglobose, lobed, often somewhat flattened, diam. up to 1 cm. but frequently smaller; peridium thin to moderately thick,

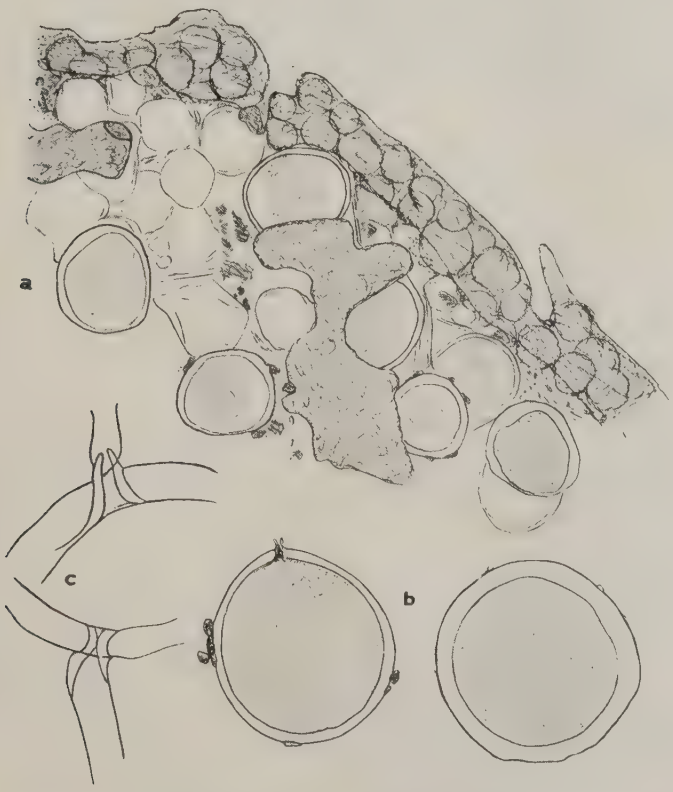

Fig. 1. *Endogone macrocarpa* Tul.
a) Section of peridium and gleba with azygospores and vesiculae. × 125. b) Two azygospores. × 250. c) Insertion of spore stipe on spores. × 1000.

dirty whitish to clay colour, somewhat reddish when bruised, gleba clay to brownish olivaceous, not very compact.

Peridium made up of branched hyphae and globose cells with debries. Azygospores globose to short oval, formed as globose swellings on ends of hyphae, yellowish olive to brownish, with slightly paler, granular content, often with some oil globules, 86—178×71—159 μ, walls 3—13 μ thick, homogeneous, refractive, incrusted on surface, spore stipe 6—9 μ thick, simple; spores irregularly arranged among hyaline, incrusted hyphae, 6—15 μ thick and often anastomosing; among the spores are distributed compact groups of abortive spores (vesiculae).

Material studied: M 4034, under *Aesculus* and *Fagus*. S. Vallø Dyrehave 16.9.1951. ML 4060, under *Corylus,* under rotten leaves. S. Boserup, 20.10.1951. M 4051a, ML 4051b, under *Tilia*. J. Hald Hovedgaard, 1.10.1951. M 4259, under *Fagus*. J. Rosenvold, 9.9.1952.

Endogone flavispora sp. n.

Fig. 2.

Fruit body firm, almost globose, somewhat lobed, diam. 0.5 cm.; peridium whitish, brown when touched and on drying, gleba darker, yellowish to dark brown, not much incrusted with soil.

Peridium of thick, brown hyphae mixed with vesiculae, vesiculae very few in central part of gleba, where azygospores are irregularly arranged among 6—12 μ broad, branched hyphae with thin walls. Azygospores ovate-oblong, often slightly constricted on the middle, rarely subglobose, 149—202×95—152 μ (individual spores varying from 171×95 to 159×152 μ), wall deep yellowish brown, 6—13 μ thick, outer thin layer somewhat lamellate, hardly incrusted, content paler, bright yellowish, granular; stipe 10—13 μ thick, simple.

The species differs from *Endogone macrocarpa* Tul. through shape and colour of spores. *Endogone tuberculosa* Lloyd from New Zealand has spores of similar shape and colour but much smaller; the characters of the outer spore wall recall some types of *Endogone lactiflua* Berk., but the spores are azygotic and differ in shape and colour.

Material studied: M 4054, under *Corylus* on clay. J. Firegaarde Skov, Ry, Oct. 1952. (Type).

Fig. 2. *Endogone flavispora* sp. n.
a) Section of peridium and gleba with azygospores and vesiculae. × 125.
b) Two azygospores. × 250.

Diagnosis. Firma, globularis, 0,5 cm lata. Peridium albidum, tactu sordidum. Gleba adustiore colore, inter alutaceum luteum fulvum ravum et fuscum varians. Peridium ex hyphis crassis, fuscis, vesiculis intermixtis compositum. Vesiculae in parte centrali glebae paucae. Azygosporae inter hyphas 6—12 μ latas, ramificatas, parietibus tenuibus irregulariter dispositae, oblongo-ovales, raro subglobulares, magnae 149—202×95—152 μ, parietibus validis, fulvis, contextu citrino, stipitibus 10—13 μ crassis, simplicibus suffultae.

Typus 16.10.1952 ad Ry, Danmark, sub numero 4054 a M. Lange lectus, in Mus. Bot. Haun. depositus.

Endogone lactiflua Berkeley

Fig. 3.

Fruit body firm, irregularly rounded, diam. 0.4 cm.; peridium white, fibrillose, gleba granulate, greyish brown, moist when sectioned, but with no distinct milky juice, incrusted with debries.

Gleba made up of irregularly arranged spores or in some places spores in regular rows, densely mixed with incrusted substrat-partic-

Fig. 3. *Endogone lactiflua* Berk.
a) Section of peridium and gleba with zygospores. × 125. b) Three zygospores. × 250. c) Insertion of spore stipe on spores. × 500.

les, amorphous, refractive exudate and hyaline, 4 μ broad hyphae; the hyphae continuous with the prominent peridium, made up of several layers of interwoven, hyalin hyphae. Zygospores hyaline to dull yellowish grey, 95—120 × 76—111 μ, wall rather thick, with an often narrow, homogeneous inner layer, and a very variable outer layer made up of lamellae or subcellular tissue, not sharpely delimited from the surrounding hyphae, stipe short, more or less distinctly indicating the zygoteous nature of the spores.

Although the "Flammenkrone" structure is not as distinct as in Bucholtz' drawings, we have little doubt to the identity of the species. The zygoteous nature of the spores and also the "Flammenkrone" is according to Thaxter (1922) often hard to see, and our material checks well with some of the specimens described under this name by both these authors.

Material studied: M. 4185, under *Fagus*. S. Rudeskov, 11.8.1952.

Another specimen, M 4055. J. Firegaarde Skov, Ry, Oct. 1951, reminds in several respects of *Endogone lactiflua*. It differs, however, in much larger spores (95—212 × 82—181 μ) and also in other, minor characters. It may belong in a species hitherto undescribed, but the material is hardly sufficient for an accurate description of a new taxon.

REFERENCES

Bucholtz, F.: Beiträge zur Kenntnis der Gattung Endogone Link. Beihefte Bot. Centralb. 29:147—225. 1911.

Harkness, H. W.: Californian hypogaeous Fungi. Proceed. Calif. Acad. Sc., ser. 3, 1:279. 1899.

Kanouse, B. B.: Studies of two Species of Endogone in Culture. Mycologia 28:47—67. 1936.

Thaxter, R.: A Revision of Endogone. Proceed. Amer. Acad. Sc. 57:291—350. 1922.

Zycha, H.: Die Pilze II — Mucorineae. Kryptogamenflora der Mark Brandenburg. Bd.VIa. 1935.

Copenhagen, June 1954.

SOLENIA CROCEA Karst. — EN FÖRBISEDD SVAMPART

Av S. WOLDMAR

Hösten 1952 fann undertecknad i Ramseröd vid Uddevalla (Sverige) små fruktkroppar av en svamp på vissna bladskaft av *Matteuccia struthiopteris* (fig. 1 och 2). Det visade sig vara *Solenia crocea* Karst., en i Sverige föga observerad svampart, hörande till familjen *Thelephoraceae*. Den är sålunda representerad med endast en kollekt i Uppsala botaniska museum, insamlad i 1894 i Lerbäcks s:n i Närke av K a r l S t a r b ä c k, och i Riksmuseets samlingar med två kollekter, båda tagna av S t a r b ä c k, den ena i Kvillinge s:n, Östergötland (1891) och den andra i Lerbäck (1894). I Lunds botaniska museum

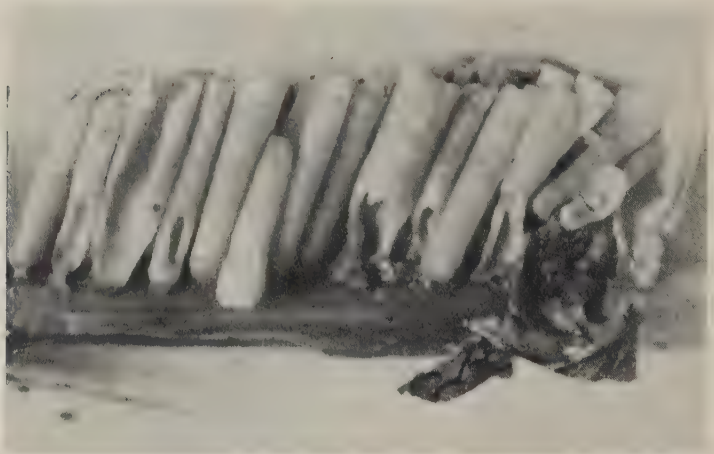

Fig. 1. *Solenia crocea* Karst. på *Matteuccia struthiopteris*, Kristinedal, Uddevalla, Sverige, aug. 1953. Fot. Gustav Carlsson. — Ung. × 10.

saknas kollekt, och i Danmark är den icke funnen (meddelande från prof. N. F. Buchwald). Litteraturuppgifterna äro sparsamma. Den omnämnes visserligen i Bourdot & Galzin: Hyménomycètes de France (p. 153, 1928) men har ej anträffats i Frankrike. Enligt mig tillgänglig litteratur synes den ej vara anträffad utanför Skandinavien.

Solenia crocea bildar ockragula, cylindriska fruktkroppar, 3—4 mm höga och c:a 0,3 mm i diameter (fig. 1 och 2). Sporerna äro avlånga, hyalina 10—12×3—4μ. Arten beskrevs av P. A. Karsten 1884 (Hedwigia 23, p. 88), men originalmaterialet hade insamlats redan i juli 1869. Karsten's beskrivning återfinnes även i „Medd. Soc. pro Fauna et Flora Fennica", 11, p. 148 (1884) och i Saccardo: „Sylloge Fungorum", 6, p. 426 (1888).

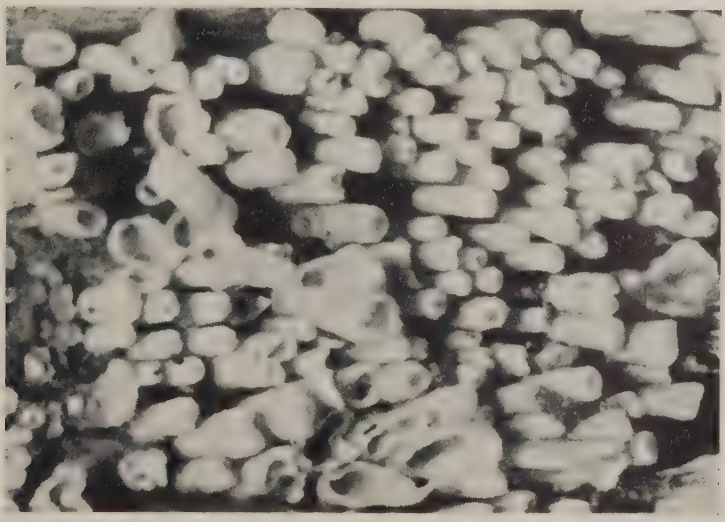

Fig. 2. *Solenia crocea* växer oftast i kolonier. Kristinedal, Uddevalla, aug. 1953. Fot. Gustav Carlsson — Ung. × 6.

Följande år (1953) anträffade jag svampen på ännu en lokal (Uddevalla, Kristinedal), och detta gav mig anledning anta, att den inte vore så sällsynt. Under augusti och september innevarande år (1954) undersöktes därför ytterligare ett 20-tal *Matteuccia*-lokaler i socknarna Ucklum, Norum, Ödsmål, Grinneröd, Ljung, Forshälla, Hjärtum, Skredsvik, Bokenäs, Foss och Lane-Ryr i mellersta Bohuslän. Då den

anträffades på samtliga undersökta lokaler, synes den alltså ej vara ovanlig inom området. Det skulle därför ej heller förvåna, om den anträffades i övriga delar av Skandinavien, där *Matteuccia* finnes, eller rent av förekomme inom hela det totala utbredningsområdet för värdväxten, d. v. s. större delen av Europa, västra och norra delen av Asien samt östra delen av Nordamerika. Materialet är dock ännu alltför otillräckligt för att svampens utbredning säkert skall kunna bedömas.

Att *Solenia crocea* är så sparsamt belagd i de större herbarierna torde bero på att den är svår att upptäcka till följd av sin ringa storlek och sitt speciella växtsätt. Den synes nämligen förekomma enbart på *Matteuccia struthiopteris* och här endast på sådana rester av bladskaft, som förekomma på äldre exemplar. S t a r b ä c k hade måhända ej heller lagt märke till den, om han inte en längre tid (1887) vistats i Mustiala som K a r s t e n ' s elev (se T. J. H i n t i k k a, „Friesia" 1, p. 216, 1935).

SUMMARY

Solenia crocea Karst. in Sweden.

The author reports finds of *Solenia crocea* Karst. from about twenty localities in central Bohuslän, Sweden, always on old stipes of *Matteuccia struthiopteris (Struthioptheris filicastrum).*

Björbäck, Uddevalla, october 1954.

PSALLIOTA MELEAGRIS Schäff. AND ITS ALLIES

By F. H. MØLLER

In the lines to follow we shall discuss a couple of observations concerning *Psalliota xanthoderma* (Gen.) Rich. & Roze, communicate a new find of *P. meleagris* and its variety *terricolor,* and finally call attention to the identity of *Agaricus perdicinus* Pilát (1953) with *Psalliota phaeolepidota* Møll. (1952).

Psalliota xanthoderma (Gen.) Rich. & Roze.

It has not as yet been possible to find in Denmark the more yellow "form" of *Psalliota xanthoderma* recorded from Sweden (Ingelström's "gulköttig giftchampignon"), nor a special deciduous forest form, which is claimed to occur in Czechoslovakia and is said to have a stronger smell of ink, particularly on being boiled, and gives rise to lighter poisonings, while the coniferous forest form is edible without reserve. In Denmark *P. xanthoderma* occurs under deciduous trees as well as under *Picea abies,* but the specimens resemble each other. As a rule they have a distinctly round bulb at the base of the stem, unlike the figures shown of the species in England (see e. g. W. G. Smith, Field and cult. mushrooms, no. 789, fig. 3, and Wakefield & Dennis, Comm. Brit. Fungi, Pl. 71, fig. 3), this bulb being fastened by one or two mycelial strands to the substratum, so that it is quite easy — merely by a slight push — to get it up without injuring it. By this character and by the fact that after turning yellow where touched, it again becomes white, at most with a faint greyish red tinge, it differs from the very similar species *P. silvicola* and *P. abruptibulba* which both on being touched, especially the former,

retain their ochraceous spots. The pellicle of the cap is very apt to crack radially and later on transversely to the cracks, which makes the cap scaly, and these scales turn dark in direct sunlight so that *P. xanthoderma* may be mistaken for the following species, though perhaps not in nature, but in books. It is claimed that Maire's two varieties, var. *lepiotoides* and var. *obscurata* are such specimens with sun-cracked and darkened caps.

Psalliota meleagris Schäff.

The description of *Psalliota meleagris* in "Danish Psalliota Species"*) (abbreviated to "D.P.S." in the sequel) was based on finds at Potsdam. Now this beautiful species has also been found in Denmark. In 1952, on an excursion to Vemmetofte Strandskov (Sealand) made by Naturhistorisk Forening for Lolland-Falster on the 21/8 1952, Mr. P. Grøntved found three fruit bodies in a small *Larix* plantation in the southwestern part of the wood. These corresponded closely to Schäffer's figures of *P. meleagris* in Michael's "Führer f. Pilzfreunde", no. 58, and to the description in "D.S.P.", pp. 172—173. This species is more rufescent than its varieties and *P. phaeolepidota,* and on the yellowish parts of the stem reddish brown spots are left. In addition the cap has a faintly brownish tinge in the black, as in Schäffer's two largest figures, while the two varieties, var. *terricolor* Møll. and var. *grisea* Pears. have a greyer cap and, as already stated, are less rufescent.

Psalliota meleagris Schäff. var. **terricolor** Møll.

Psalliota meleagris var. *terricolor* is figured in "D.P.S.", pl. XX, fig. a and was first described as *Psalliota meleagris* var. *obscurata* Maire (l. c., p. 174), but was later renamed *P. meleagris* var. *terricolor* (l. c., p. 208). Last summer (21/8 1954) Mr. Frede Terkelsen, Danebod High School, Als, Denmark, stopped in surprise before a beautiful young fruit body of this variety growing on the bare ground under *Fagus, Ulmus,* and *Acer* in the Fredskov on Als near the High School. Mr. Terkelsen at once had a couple of excellent water-colours made (see figure) and sent these as well as the fungus after examination to the present author who confirmed what the finder had

*) "Friesia" 4: 1—60 and 135—220, 1950—1952.

Psalliota meleagris Schäff. var. *terricolor* Møll.
Fredskov, Als, under *Fagus, Ulmus,* and *Acer,* 21. August 1954. Frede Terkelsen leg. — Figures from watercolours by Mr. Hermod Knudsen. — Nat. size.

indeed seen at once, viz. that it was the above-mentioned variety though the collar was somewhat more stoutly developed, the bulb of the stem slightly marginate, and the spore powder somewhat darker ("Mummy Brown" in Ridgway), than in the specimens from Saxkjøbing ("D.P.S.", p. 174), whereas all the rest agreed, including the microscopical details (sp. 4. 5—6×3—3.5 μ, basidia 20×5—6 μ, cystidia 20×9—11 μ, pear-shaped). *P. melcagris* var. *grisea* Pears., according to a watercolour (sent to the author by Mr. Pearson with the description) has a lighter grey cap, a very narrow collar and "spores subglobose, 5×4 μ".

Psalliota phaeolepidota Moll. (1952) and **Agaricus perdicinus** Pilát (1953).

Psalliota phaeolepidota was erected as a new species ("D.P.S.", p. 170, 1952) at a time when *Agaricus perdicinus* as yet only existed as a variety of *P. meleagris,* mentioned in a few lines by Pilát in "The Bohemian Species of the Genus Agaricus" (1951, p. 108 and 112).

P i l á t had received his specimens from the Kinský Park at Prague (Ing. B e n d a leg.) and regarded them as identical with J. S c h ä f f e r's "Rebhuhnform" of *P. meleagris,* which form resembles the Danish *P. phaeolepidota* in colour (see S c h ä f f e r's picture in "Michael", no. 58, right). But as P i l á t in 1951 did not give further information of the microscopical details nor a really clear description, even less a Latin diagnosis of his variety, and since S c h ä f f e r previously regarded his "Rebhuhnform" as unimportant, with transitional forms to the type and always growing in company with it (see quotations in "D.P.S.", p. 174), the foundation was, in the present author's opinion, too slight to associate a good species such as *P. phaeolepidota* with a still insufficiently examined and described find in Czechoslovakia which had, in addition, been identified with a *meleagris* form to which S c h ä f f e r did not attach any importance. It is true that P i l á t had taken good photographs of his variety, but the decisive proof of its identity with *P. phaeolepidota* was lacking, since photographs even of the very finest quality, cannot make up for a good description but can only support it.

In a letter of the 13/3 1952 to the author P i l á t wrote, „Ich glaube, dass *Psalliota phaeolepidota* M ø l l. mit *Agaricus meleagris* var. *perdicinus* P i l á t identisch ist (das ist der S c h ä f f e r's Rebhuhnegerling). Dieser Pilz ist keine Varietät, sondern eine gute Art, die von *Ag. meleagris* völlig verschieden ist. Es tauscht mich nur Ihre farbige Abbildung (pl. XX). Die Farbe ist sehr lebhaft ockergelb gedrückt. Die Hutfarbe bei meinem *Ag. perdicinus* ist mehr trüb ockerbraun".

This letter, I regret to say, was, wrongly, not answered by the present author. P i l á t might then perhaps believe that his view was not sanctioned, which, however, it tacitly was, and later when in 1953 he published the excellent treatise "Hymenomycetes novi vel minus cogniti Czechoslovakiae, II" the present author was further confirmed in his conviction of the identity of the two forms. For here P i l á t gives a very exact description, throughout in Latin, of his fungus, which he now calls *Agaricus perdicinus* P i l á t n. sp. He does not, however, say a single word about *P. phaeolepidota* but by his description he has proved that the two species have the essential characters in common. His description of the colour of the scales of the cap reads as follows: "squamis pallide brunneis tinctu debili purpurino (cacao et coffea cum lacte combinatae)". As to P i l á t's criticism of the colour reproductions in "D.P.S." there is this to be said that these reproductions have actually turned out to be a tinge too lively in

colour, but incidentally the most colourful among the original water-colours were selected for reproduction.

Up to this the species has only been demonstrated with certainty in the Kinský Park (Prague) and Sundby Ferrystation's garden in Lolland, Denmark. Its future name must be *Psalliota phaeolepidota,* which name is one year previous to the otherwise excellent name *Ag. perdicinus,* which Pilát probably gave it in memory of my late good friend Julius Schäffer of Potsdam. Whether Schäffer's "Rebhuhnform" was really *P. phaeolepidota* will perhaps never be cleared up.

Nykøbing, Falster, November 1954.

NOTITSER

Christopher Fredrik Bøhme
1888—1951

Christopher Fredrik Bøhme var opprinnelig forrettningsmann. Som interessert amatør erhvervet han seg imidlertid et kjennskap til storsoppartene som gjorde ham til Norges ubestridt første soppekspert i årene fra 1930 og til hans død i 1951.

Bøhme grunnla Oslo Helseråds Soppkontroll i 1932, og han fungerte som Helserådets soppkontrollør til 1941. Til å begynne med hadde soppkontrollen bare den funksjon å kontrollere den sopp som ble solgt eller torgført i Oslo. Men under Bøhme's virksomhet utviklet soppkontrollen seg til en overordentlig effektiv undervisningsinstitusjon i matnyttig sopp for det brede publikum i Oslo. Etter få år ble soppkontrollen almindelig kjent som et sted hvor folk hver dag i en bestemt kontortid kunne komme med sine soppprøver og få dem bestemt. Han planla den videre utbygning av Helserådets soppkontroll og hans planer er blitt fulgt i årene etterpå og er nå realisert.

Opp gjennom 30-årene arbeidet Bøhme energisk for å få opprettet en egen konsulentstilling for matnyttig sopp. Dette arbeid var ferdig forberedt da krigen kom og i 1941 ble Bøhme utnevnt som statskonsulent.

Bøhme måtte nå gi avkall på sin stilling som kontrollør ved Oslo Helseråd og han viet seg i soppsesongen helt til foredragsreiser og demonstrasjoner. Han fungerte som statskonsulent til 1946, og i disse fem årene kjenner vi til at han arrangerte minst 120 ekskursjoner rundt omkring i Norge.

Under sine reiser og ekskursjoner nedla Bøhme et meget stort arbeide i å lage floralister, som er blitt arkivert på Botanisk Museum. Dette materiale er allerede blitt brukt i en rekke skandinaviske publikasjoner, og det vil også sikkert bli til stor nytte for dem som skal forfatte floristiske arbeider i fremtiden.

Bøhme skrev en rekke populære artikler om matsopp i aviser og tidsskrift. Det var først og fremst „Våre Nyttevekster" som nød godt av hans produksjon. Hvert år publiserte han i „Våre Nyttevekster" detaljerte beretninger om virksomheten ved Helserådets soppkontroll. (Disse meldinger er også trykt i Oslo Helseråds årsberetning). Om soppkontrollens virksomhet har Bøhme også skrevet i andre tidsskrift („Nytt Magasin" 78: 105—112, 1938; „Friesia" 3: 174—176, 1946).

En stor innsats gjorde han ved sine to populære soppbøker, „Norsk Soppbok" (1936) og „Lommesoppbok" (1942). Han gjorde også en stor innsats ved å sette norske navn på en rekke storsopparter (jfr. „Våre Nyttevekster", 1936, nr. 2).

Bøhme's største betydning for soppsaken i Norge lå i at han klarte å formidle forbindelsen mellom vitenskapelig, eksakt artskjennskap og behovet for veiledning blant interesserte amatører. Hans innsats her hang sammen med at han selv var en skarp artskjenner og en begavet og entusiastisk foredragsholder og at han på en energisk måte gjennomførte et stadig samarbeid med de vitenskapelige institusjoner, først og fremst med Botanisk Museum ved Universitetet i Oslo.

På dette felt, kontakten mellom den vitenskapelige og den populære soppinteresse, representerte Bøhme noe nytt. Her dannet han skole og la et grunnlag, som fremdeles på en gunstig måte preger både mykologi og soppsak i Norge.

Oslo, november 1954.

Kristian Horn. Jens Stordal.

Norsk Soppforening. Det synes å være en stigende interesse for sopp i Norge. Dette gjelder ikke bare sopp som mat, men også de botaniske problemer som knytter seg til denne del av vår flora. Fra flere hold er det ytret önske om å danne en norsk soppforening. For å tilfredsstille dette önsket, innkalte amanuensis F.-E. Eckblad og undertegnede til et möte i Oslo 11. juni 1954. På mötet ble det enstemmig vedtatt å stifte en norsk soppforening. Undertegnede ble valgt som formann, og forsamlingen valgte dessuten et forelöpig styre bestående av A. Bilit fra Sarpsborg, Fr. Delphin og F.-E. Eckblad fra Oslo og Gunnar Soot fra Rauöy. Styret fikk som oppgave å arrangere et program for hösten 1954 og dessuten utarbeide et lovutkast til generalforsamlingen.

Vi har hatt 5 söndagsturer:

8. august til Siggerud kapell i Ski under ledelse av formannen.
22. august til Vestby st. med Gunnar Soot som leder.
5. september til Björgum sag i Bærum med Eckblad som leder.
19. september til Sognsvatn med Kristian Horn som leder.
13. oktober til Dröbak med formannen som leder.

Lederne av disse turene vil skrive en melding som forelöpig blir arkivert. Det har vært et dårlig soppår i år, og resultatet av ekskursjonene vært magrere enn håjet. Likevel har vi samlet en del opplysninger og materiale av interesse.

Den 20. oktober innkalte så det forelöpige styret til generalforsamling på Universitetet på Ålindern, Oslo. Styrets forslag til lover ble grundig diskutert og vedtatt med en del forandringer. Foreningen fikk navnet „Norsk Soppforening (N.S.F.)." Som utdrag av lovene vil jeg nevne § 2:

„Foreningen er en landsforening, åpen for alle, med det hovedformål å utbre og öke kjennskapet til Norges sopparter, samt å arbeide for at matnyttige sopper skal innta en större plass i ernæringen. For dette formål arbeider foreningen ved å arrangere ekskursjoner, avholde möter med fore-

drag og demonstrasjoner, arrangere sopputstillinger samt å utgi et medlemsblad."

Det ble valgt nytt styre som nå består av Jens Stordal, formann, fru Inger Anne Lysebraate, A. Bilit, Fr. Delphin og F.-E. Eckblad med fru Alette Buttingsrud og Ove Arbo Höeg som supleanter.

Vi har stadig diskutert hvorledes vi skal få kontakt med soppinteresserte i landet ellers. Det er allerede stiftet en soppforening i Trondheim, og Soppforeningen i Bergen har tatt opp arbeidet igjen.

Det er ingen grunn til å skille for skarpt mellom sopp som mat og sopp som botanikk, men vi håper spesielt at foreningen kan få bety noe for den botaniske siden. Samarbeidet med de ovenfor nevnte foreningene og interesserte ellers har allerede gitt mange nye opplysninger om soppenes geografiske utbredelse. Slike opplysninger er det et meget stort behov for, og vi håper at et samarbeid mellom sopp-amatører vil bære rike frukter.

Oslo, november 1954. Jens Stordal.

R. Kühner & H. Romagnesi: Flore analytique des Champignons supérieurs. (Agarics, Bolets, Cantharelles). Masson & Cie. Paris 1953. 558 s. 677 fig. — 7970 ffr. indb.

Den franske agaricace-forskning har i mange år stået på et meget højt stade; det foreliggende arbejde, skrevet af to af de ypperste af Frankrigs mykologer, vil i lang tid fremover stå som en syntese af den lære, der er grundlagt af Patouillard, Fayod og Quélet.

Bogen er tilrettelagt som en flora med slægts- og artsnøgler. Nøglerne er dog gjort så udførlige, at der i realiteten gives ret fuldstændige beskrivelser af samtlige arter, med de vigtigste mikroskopiske og makroskopiske karakterer. For hver art er der endvidere henvisning til een eller flere afbildninger i andre værker, — eller til en udførlig beskrivelse — og til de vigtigste synonymer. I selve værket er der talrige illustrationer i streg, de fleste habitusbilleder, kopierede fra andre værker, især Flora Agaricina Danica; der er dog også mange originale tegninger af H. Romagnesi. Endvidere er der for hver slægt en samling kritiske noter om de enkelte arter.

Den systematiske opdeling af værket er nærmest mere konservativ end man kunne vente. Naturligvis er inddelingen af nogle af de hvid- og brunsporede slægter stærkt afvigende fra den klassiske. Slægterne Armillaria, Tricholoma og Pleurotus er ganske omkalfatrede, hvorimod de nyere forsøg på at opdele Lepiota, Mycena og Marasmius i hovedsagen er ignorerede. Blandt de brunsporede er det især Pholiota, Flammula, Galera og Naucoria, der er blevet spaltet op og omgrupperet. Blandt de sortsporede har man fulgt eksemplet fra Cortinarius og Rhodophyllus og samlet beslægtede grupper i store slægter. Slægterne Hypholoma, Psathyra, Stropharia og Psilocybe udgør nu kun to — ret naturlige — slægter, og denne tendens ses også ved defineringen af Hygrophorus, Cantharellus og Boletus. Fra denne sidste slægt er end ikke den stærkt afvigende Strobilomyces udskilt. Det er nu for reserveret en holdning, selv om den gode vilje kan påskønnes. De nærmere enkeltheder i den slægtsmæssige opdeling vil ses i nedenstående oversigt, hvor der sammenlignes med den klassiske inddeling i „Flora Agaricina Danica" og den moderne fra R. Singer's monografi: „The Agaricales in modern taxonomy".

Artsafgrænsningen er ret velbalanceret i de forskellige slægter, og i det hele på højde med nyere monografier; ligeledes er artsnavnene valgt med et rimeligt hensyn også udover fransk tradition. (Artsopfattelsen og nomenklaturen i Cortinarius vil dog nok volde vanskeligheder; der er opført

omkring 300 arter, især støttet på R. Henry's arbejder). Derimod er slægtsnomenklaturen ikke altid særlig lykkelig. De i forordet definerede afvigelser fra de internationale regler har ført til anvendelse af navnene Dryophila, Geophila og Drosophila for hhv. Pholiota, Hypholoma-gruppen og Psathyra-gruppen. Anvendelse af navnene Pholiota, Hypholoma og Psathyrella er i alle henseender mere ønskelig — og de opgravede Quélet-ske navne har da heller aldrig fundet anvendelse udenfor Frankrig. Tilsvarende uheldig er den fortsatte misbrug af Orchide-navnet Galera. Men med disse og enkelte andre, mindre betydningsfulde ændringer kan det anbefales at anvende de foreslåede slægtsbenævnelser i den foreslåede afgrænsning.

Nedenfor følger oversigten over slægterne hos Kühner & Romagnesi, sammenlignet med de tilvante slægter („Flora Agaricina Danica") og med de talrigere slægter efter Singer:

Flora Agaricina Danica	Kühner & Romagnesi	Singer
Amanita	*Amanita*	*Amanita*
Limacella	*Limacella*	*Limacella*
Lepiota	*Lepiota* s. restr.	*Lepiota* s. r., *Leucocoprinus, Leucoagaricus, Macrolepiota, Melanophyllum*
(Cystoderma)	*Cystoderma*	*Cystoderma*
Armillaria	*Tricholoma* p. p.	*Armillaria, Tricholoma* p. p.
	Clitocybe	*Armillariella*
Tricholoma	*Tricholoma* s. restr.	*Tricholoma* s. restr., *Tricholomopsis* p. p.
	Rhodopaxillus	*Lepista*
	Leucopaxillus	*Leucopaxillus*
	Lyophyllum p. p.	*Lyophyllum* p. p., *Calocybe, Rhodocybe* p. p.
	Clitopilus p. p.	*Clitopilus* p. p.
(Melanoleuca)	*Melanoleuca*	*Melanoleuca*
Clitocybe	*Clitocybe* s. restr.	*Clitocybe* s. r., *Cantharellula*
(Difformes)	*Lyophyllum*	*Lyophyllum*
(Laccaria)	*Laccaria*	*Laccaria*
Collybia	*Collybia* s. restr.	*Collybia* s. r., *Flammulina, Oudemansiella, Xerula, Baeospora, Pseudohiatula*
(Tephrophanae)	*Lyophyllum* p. p.	*Lyophyllum* p. p.
	Tricholoma p. p.	*Tricholomopsis*
Marasmius	*Marasmius* s. restr.	*Marasmius* s. r., *Marasmiellus, Micromphale*
(Crinipellis)	*Crinipellis*	*Crinipellis*
Mycena	*Mycena*	*Mycena* s. r., *Marasmiellus*
(Mycenella)		*Mycenella*
Omphalia	*Omphalia* s. restr.	*Omphalina* s. r., *Clitocybe* p. p., *Fayodia*
	Xeromphalina	*Xeromphalina*

Flora Agaricina Danica	Kühner & Romagnesi	Singer
(Mycenarii)	*Mycena* p. p.	*Mycena* p. p., *Marasmiellus* p. p.
(Albatae)	*Delicatula*	*Delicatula*, *Marasmiellus* p. p.
Pleurotus	*Pleurotus* s. restr.	*Pleurotus* s. r.
	Phyllotopsis	*Phyllotopsis*
	Geopetalum	*Hohenbuchelia*, *Resupinatus (Geopetalum* s. r.)
	Pleurotellus	*Pleurotellus*
Panus	*Panus* s. restr.	*Panus* s. restr.
	Panellus	*Panellus*
Volvaria	*Volvaria*	*Volvariella*
Pluteus	*Pluteus*	*Pluteus*
Rhodophyllus	*Rhodophyllus*	*Rhodophyllus*
Cortinarius	*Cortinarius*	*Cortinarius*
(Leucocortinarius)	*Leucocortinarius*	*Leucocortinarius*
Pholiota	*Dryophila*	*Pholiota* s. r., *Kühneromyces*
(Rozites)	*Rozites*	*Rozites*
(Phaeolepiota)	*Cystoderma* p. p.	*Phaeolepiota*
(Humigenae)	*Agrocybe*	*Agrocybe*
	Galera p. p., *Conocybe* p. p.	*Galerina*, *Pholiotina*
Inocybe	*Inocybe*	*Inocybe*
Hebeloma	*Hebeloma*	*Hebeloma*
Flammula	*Gymnopilus*	*Gymnopilus*
	Dryophila	*Pholiota*
Naucoria	*Naucoria* s. restr.	*Naucoria* s. r., *Alnicola*, *Phaeomarasmius*
(Macrocystidia)	*Macrocystidia*	*Macrocystidia*
(Collybioideae)	*Phaeocollybia*	*Phaeocollybia*
(Pediades)	*Agrocybe* p. p.	*Agrocybe* p. p.
Tubaria	*Naucoria* p. p., *Geophila* p. p.	*Tubaria* s. r., *Deconica* p. p.
(Phaeotae)	*Geophila* p. p.	*Deconica* p. p.
Galera	*Conocybe*	*Conocybe*, *Pholiotina* p. p.
(Galerina)	*Galera*	*Galerina*
Bolbitius	*Bolbitius*	*Bolbitius*
Plutcolus	*Bolbitius* p. p.	*Pluteolus*
Crepidotus	*Crepidotus*	*Crepidotus*
Paxillopsis	*Clitopilus*	*Clitopilus*
(Ripartites)	*Ripartites*	*Ripartites*
Paxillus	*Paxillus*	*Paxillus*
(Phylloporus)	*(Phylloporus)*	*Phylloporus*
Psalliota	*Psalliota*	*Agaricus*
Stropharia	*Geophila* p. p.	*Stropharia* s. r., *Psilocybe* p. p.

Flora Agaricina Danica	Kühner & Romagnesi	Singer
	Panaeolus p. p.	*Anellaria*
(Spintrigerae)	*Drosophila* p. p.	*Psathyrella* p. p.
Lacrymaria	*Drosophila* p. p.	*Psathyrella* p. p.
Hypholoma (Naematoloma)	*Geophila*	*Naematoloma*
(Psathyroides)	*Drosophila* p. p.	*Psathyrella* p. p.
Psilocybe (Fasciculares)	*Drosophila* p. p.	*Psathyrella* p. p.
(Solitares)	*Geophila* p. p.	*Naematoloma* p. p.
(Deconica)	*Geophila* p. p.	*Deconica*
Panaeolus	*Panaeolus*	*Panaeolus, Panaeolina*
Psathyra	*Drosophila*	*Psathyrella*
Pseudocoprinus	*Coprinus* p. p.	*Pseudocoprinus*
Coprinus	*Coprinus*	*Coprinus*
Gomphidius	*Gomphidius*	*Gomphidius*
Melanomphalia	—	—
Nyctalis	*Nyctalis*	*Asterophora*
Limacium	*Hygrophorus*	*Hygrophorus*
Camarophyllus	*Hygrophorus*	*Camarophyllus*
Hygrocybe	*Hygrophorus*	*Hygrocybe*
Lactarius	*Lactarius*	*Lactarius*
Russula	*Russula*	*Russula*
Cantharellus	*Cantharellus*	*Cantharellus*
(Clitocyboidei)	*Hygrophoropsis*	*Hygrophoropsis, Cantharellula* p. p.

Udover det rent systematiske afsnit bemærker man sig mindre stykker om de vigtigste punkter i den anvendte teknik, især hvad angår anvendelsen af kemiske reagenser, en fortrinlig fortegnelse over fagudtrykkene og en lille oversigt over svampeforgiftninger. I selve nøglerne er der iøvrigt med et efter værdien svingende antal korslagte knive og gafler gjort opmærksom på arternes kulinariske værdi. I det hele er der grund til at bemærke hvilken omhu, der er lagt i at placere generelle oplysninger i nøglerne ved hjælp af et sindrigt forkortelses- og tegnsystem. I fortegnelsen over disse mangler *, der betyder, at arten ikke er set af forfatterne selv. Naturligvis finder man også andre fejl hist og her udover de anførte „errata graviora" — således står „Friesia" anført som udkommende i Stockholm! Dog i det hele er det ikke blot en god og overmåde nyttig flora, men også et smukt og stateligt værk.

Morten Lange.

G. C. Ainsworth & G. R. Bisby: A Dictionary of the Fungi. VIII + 475 S., 138 Fig. 4. ed. 1954. The Commonwealth Mycological Institute, Kew. — Pris: 20 shillings indb.

I 1943 udgav de to kendte engelske Mykologer, G. C. Ainsworth og G. R. Bisby, der paa det Tidspunkt begge var knyttet til The Commonwealth Mycological Institute, Kew, et Leksikon over Svampe, som dog paa Grund af Krigen næppe blev kendt uden for den engelsktalende Del af Verden. Men blot to Aar efter, i 1945, fremkom en ny, revideret Udgave, og derved blev Leksikonnet udbredt til videre Kredse. I 1950 kom en 3. Udgave, og nu i Aar (1954) foreligger allerede 4. Udgave. Bedre end mange

Ord siger disse hurtigt paa hinanden følgende Udgaver, at et Værk af denne Art maa have været stærkt savnet blandt Mykologer, og der er derfor al mulig Anledning til ogsaa at henlede de skandinaviske Mykologers Opmærksomhed paa den nye Udgave.

Leksikonnet er i et handy Format (19×13 cm) og leveres som alle engelske Bøger i indbundet Tilstand. Omfanget er gradvis forøget fra Udgave til Udgave; medens 1. Udg. kun omfattede 359 S., er 4. Udg. saaledes naaet op paa 475 Sider. Det drejer sig ikke om en Ordbog i almindelig Forstand. Forfatternes Hovedformaal har været at give en alfabetisk Fortegnelse over alle Slægtsnavne paa Svampe (Eumycetes og Myxomycetes), men ikke Likener og Bakterier; godt og vel 7000 Slægter nævnes, med Angivelse af Slægtens Autor, systematiske Stilling, Artsantal og geografiske Udbredelse. Omtrent Halvdelen af de opførte Slægtsnavne er dog Synonymer! Til denne Slægtsfortegnelse slutter sig korte Angivelser af de vigtigste Familier, Ordner og Klasser inden for baade Svampe, Likener og Bakterier. Denne Del af Bogen svarer saaledes til Clements & Shear's kendte Værk "The Genera of Fungi" (1930), som den naturligvis ogsaa bygger paa, men dog ikke helt kan erstatte. Men Leksikonnet er tillige en Ordbog, idet det giver en Forklaring paa tekniske Termini inden for Mykologi, Likenologi, Bakteriologi og Plantepatologi. De medtagne Termini vedrører baade Morfologi, Anatomi, Cytologi, Fysiologi og Genetik; i Flæng kan nævnes „subiculum", „flexuous hypha", „dikaryon", „dual phenomenon", „pathogen" og „heterothallism".

Leksikonnets Indhold er dog langt fra hermed udtømt. Det indeholder ogsaa talrige længere Artikler om Emner af mere almindelig Interesse for den arbejdende Mykolog, f. Eks. Artikler om Antibiotika, Fungicider, Nomenklatur, Klassifikation, Serologi, Symbiose, Økologi, Svampenes geografiske Udbredelse o. s. v. Af stor Interesse er ogsaa Biografierne, ganske vist korte, af mange af de mest kendte Mykologer som Fries, de Bary, Berkeley, Cooke, Persoon, Saccardo, Quélet, von Höhnel o. m. fl., (dog ingen danske Mykologer, hverken E. Rostrup eller Emil Chr. Hansen!) samt en ret udførlig alfabetisk ordnet Fortegnelse over de mykologiske Autorer med Angivelse af deres Fødsels- og Dødsaar. Men i det hele taget vil man finde, jo mere man fordyber sig i Bogen, at den rummer et Væld af saavel nyttige som interessante Oplysninger.

Et meget værdifuldt Træk ved Leksikonnet er endvidere dets talrige Henvisninger til den originale Litteratur, baade Haandbøger, Monografier og Tidsskriftafhandlinger, hvor man kan finde yderligere Oplysninger om de paagældende Emner. Saaledes er Leksikonnet ikke alene en Fører i Svampenes udstrakte Rige, men ogsaa i den omfattende Litteratur om Svampene.

Bogen slutter med 3 Tillæg. Det første Tillæg giver en systematisk ordnet Oversigt over alle de i Bogen omtalte Slægter (incl. synonyme Slægtsnavne). Det andet Tillæg indeholder en Nøgle til alle Klasser, Ordner og Familier. Nøglen er affattet af den kendte amerikanske Mykolog G. W. Martin, Iowa Universitetet, og det er ogsaa hans Svampesystem, der er lagt til Grund overalt i Leksikonnet. Endelig omfatter det tredie Tillæg 10 Tavler med ialt 138 let skitserede Figurer, der illustrerer en Række af de i Bogen definerede Termini; der er her Tale om f. Eks. Typer af Frugtlegemer, Gametangier, Sporangier, Sporer m. m. m.

Under Udarbejdelsen af de forskellige Udgaver har Forfatterne modtaget stor Hjælp fra mange Mykologer, og selv om Specialisten selv i 4. Udgave her og der nok vil kunne finde Ting, han ikke kan være enig med dem i, eller som mangler, ja maaske oplagte Fejl, maa alle Mykologer være de to Forfattere meget taknemmelige for det overordentlig store Arbejde, de har nedlagt i Bogen. Efter Anm.s Mening er Leksikonnet en af de mest nyttige mykologiske Bøger, han kender. Den har Bud til alle Mykologer, baade dem, der beskæftiger sig med Mykologien ex officio, og dem, der dyrker denne Videnskab con amore.

N. Fabritius Buchwald.

Fund af Lactarius chrysorrheus paa Fyn. Den i Henhold til Poul Larsen i de jydske Egekrat saa almindelige Lactarius chrysorrheus*) har jeg fundet to Gange, nemlig den 26. September 1948 og den 20. September 1950, paa samme Lokalitet under unge Ege i Højsholt Skov, Syd for Tommerup, Fyn. I de følgende Aar synes den at være forsvundet fra Findestedet.

Tommerup, Oktober 1953. A. P. Skovsted.
pens. Lærer.

Inocybe Patouillardii fundet i Sønderjylland. Den sjældne og meget giftige Inocybe Patouillardii Bres., der i Henhold til Overlærer F. H. Møller's Undersøgelser (1922)**) kun er fundet paa Lolland og Falster samt en enkelt Gang paa Sjælland, fandt jeg den 11. Juli 1942 under Fagus silvatica i Graasten Slotspark. Saavel de makroskopiske som de mikroskopiske Karakterer stemte overens med Beskrivelserne hos Møller og Lange (F.A.D. III, S. 81). Efter et Par Dages Henliggen blev Stokken næsten helt rød. Inocybe Patouillardii er saaledes nu ogsaa kendt fra Sønderjylland.

Danebod Højskole, Als, Januar 1954. Frede Terkelsen.

Svampefund paa Assistents Kirkegaard i København, August 1954. Paa vore store Kirkegaarde gaar man almindeligvis ikke paa Svampejagt, og dog kan man her, hvor der ofte vokser mange forskellige Træer, finde ikke saa faa Svampearter, blot den nødvendige Fugtighed er til Stede. I 1954 har den regnrige Sommer givet Svampene særligt gode Vækstbetingelser, og allerede i Slutningen af Juli var der paa Assistents Kirkegaard i København mange Champignoner, Netbladhatte og Skørhatte fremme. Notater her den 3. og 6. August gav nedenstaaende Svampeliste.

Af Listens Arter fortjener enkelte særligt at fremhæves: Armillaria glioderma (Fr.) Lange, to Fund (tidligere kun fundet paa Falster). Boletus versicolor, der voksede i Mængde paa en Græsrabat, og Psilocybe sarcocephala, der er ret sjælden, men her stod i Klynger ved Foden af en Elm (Ulmus) og en Hestekastanie (Hippocastanea).

Armillaria glioderma.
Boletus subtomentosus (med Sepedonium), versicolor.
Clitocybe aggregata var. sphaerospora, conglobata, talrige Steder, laccata var. amethystina.
Collybia radicata.
Coprinus atramentarius, mange Steder, comatus forma sphaerocephalus, micaceus, talrige Steder, plicatilis.
Eccilia undata.
Entoloma rhodopolium.
Hypholoma fasciculare, lacrymabundum, mange Steder.
Inocybe jurana, obscura, pusio.
Lactarius torminosus under Betula, turpis under Betula.
Lepiota cristata i Græsrabatter.

*) Se »Friesia« 1: 177, 1934.
**) Se bl. a. »Friesia« 3: 401—402, 1949. — Ogsaa fundet paa Møens Klint (»Flora og Fauna« 53: 109. 1947).

Marasmius oreades i Græsrabatter, rotula, stipitarius ved Syringa.
Mycena sanguinolenta.
Nolanea papillata.
Paxillus involutus under Betula.
Peziza vesiculosa.
Pholiota erebia i Græs.
Pholiota mutabilis.
Polyporus applanatus, fomentarius paa gammel Fagus, giganteus.
Psalliota edulis, talrige Steder.
Psathyra Gordonii, stipatissima.
Psathyrella disseminata.
Psilocybe foenisecii i Græs, sarcocephala.
Russula depallens, foetens.
Scleroderma verrucosum, flere Steder paa Gangene.
Thelephora terrestris.
Tricholoma myomyces i Græsrabatterne.
Tubaria autochthona.

København, August 1954. M. P. Christiansen.

Hydnum scabrosum Fr. (Bitter Pigsvamp) i Asserbo Plantage. Fra Frk. Ragnhild Boeck, Tisvildeleje, modtog Foreningen til Bestemmelse i August 1953 nogle unge Eksemplarer af en skællet, bitter Hydnum-Art, der var samlet den 8. August 1953 i Asserbo Plantage. Da ingen af de bitre Hydnum-Arter (H. fennicum, H. scabrosum og H. subsquamosum) syntes at være iagttaget tidligere i Danmark, blev Materialet sendt op til fil. dr. Seth Lundell, Uppsala, til Bestemmelse. I Skrivelse af 22.8.1953 meddelte Dr. Lundell, at det drejede sig om Hydnum scabrosum Fr., som han havde lært at kende godt i de senere Aar. Arten er ogsaa sjælden i Sverige, hvor den synes at foretrække „torra, sandiga tallskogar". De danske Eksemplarer var af rødbrun Farve, Hatten med store, kantede Skæl, Piggene graalige til brunlige og Stokken violet til blaa ved Basis. Konsistensen var kødet som hos Skællet Pigsvamp (Hydnum imbricatum). Baade Hat og Stok var indvendigt hvide. Sporer rundagtige, piggede, 5—6 μ store.

København, August 1954. N. Fabritius Buchwald.

Nye danske Lokaliteter for Karbol-Champignon (Psalliota xanthoderma). Karbol-Champignon er af Docent Aksel Rohde, København F., fundet 5 Aar i Træk paa Fabriksvejen ved Bing & Grøndahl's Porcelænsfabrik, Vesterbrogade, København. Undertegnede har haft Lejlighed til at verificere Bestemmelsen. Docent Rohde har endvidere meddelt, at han ogsaa har fundet Karbol-Champignon ved Gudhjem, Bornholm.

Fra Ebba Thorning Bensen, Helsingør, modtog Foreningen den 29. Juli 1954 en smuk Sending Karbol-Champignoner, der var samlet i Omegnen af Helsingør.

Endelig indleverede Frk. Lund, Frederiksberg, den 5. August 1954 til Foreningen over en Snes gamle og unge Eksemplarer, der var fundet den foregaaende Dag i Haveselskabets Have, København.

København, August 1954. N. Fabritius Buchwald.

Fra Pigsvampenes Paradis. Rind plantage ved Herning må siges at være et rent Eldorado for pigsvampe. På „Herning naturhistoriske Forening"s ekskursion til Skærbæk og Rind den 12. september 1954 fandtes følgende 8 arter af slægten Hydnum: H. aurantiacum, caeruleum, cyathiforme, ferrugineum, ferruginosum, friabile, graveolens og repandum. På den samme lokalitet er tidligere fundet: H. imbricatum og zonatum.

På den samme ekskursion fandt man Cantharellus olidus (bestemmelsen verificeret af F. H. Møller). Denne sjældne svamp minder ved første øjekast om en afbleget Cantharellus aurantiacus, men ved gnidning af lamellerne og ved hentørring dufter den „som orangeblomster eller brændt sukker", siger Konrad & Maublanc, der henfører begge arter til slægten Clitocybe. Dens duft mindede mig om duften af Nolanea icterina. Cantharellus olidus hører ellers hjemme i bjergnåleskove (Jura, Alperne) og er mig bekendt, ikke tidligere fundet i Danmark. Den har meget små sporer (3—4×3 μ).

Af andre ikke helt almindelige arter fandtes på samme ekskursion følgende: Inocybe rubescens, Leptonia chalybaea, Pholiota brunneola sensu Lange, Pholiota pumila var. subferruginea sensu Lange, Pholiota unicolor, Russula adusta sensu Fries og Tricholoma focale.

Danebod Højskole, Als, september 1954. Frede Terkelsen.

Märkliga svampfynd i Umeå-trakten. 1. Pisolithus arenarius Alb. et Schwein. hittades den 9.9.1951 efter skogsväg i sandig barrskog, Piparböle, Umeå s:n, 7 km. V. Umeå. Den 1.9.1953 hittades ytterligare ett exemplar å samma lokal (det. J. A. Nannfeldt). Den 12.8.1954 fann jag ett exemplar av samma svamp i Stöcksjö, Umeå s:n, 9 km. S. Umeå i landsvägsdike på sandbotten i barrskog (det. N. F. Buchwald).

Pisolithus arenarius Alb. et Schwein.
Sandig barrskog, Piparböle, Umeå s:n, 7 km. V. Umeå, Sverige. — Efter akvarell av L. Hjortsberg.

Pisolithus arenarius är ytterst sällsynt i Sverige och har enligt Thore C. E. Fries: Sveriges Gasteromyceter (Ark. f. Bot. 17:9) blivit funnen endast å två lokaler, nämligen i Halland (enl. E. Fries i S. Veg. „Rip. Nissae") samt i Ångermanland (Anundsjö s:n nära Pengsjö 1898 och 1913).

2. Mycenastrum corium (Guers.) Desv., Stöcksjö, Umeå s:n, på tennisplan å sandgrund 12.8.1953 (det. Seth Lundell).

3. Scleroderma cepa (Vaill.) Pers. å samma lokal 18.8.1954 (det. N. F. Buchwald).

4. Nidularia denudata Fr. 30.9.1951, Piparböle, Umeå s:n, å murken ved efter skogsväg i sandig barrskog, 4.11.1951 Stöcksjö, Umeå s:n, på pinne å sandjord (det. S. Lundell).

5. Cordyceps capitata (Holmskj.) 30.8.1953 i fuktig barrskog, Håkmark, Umeå s:n, 10 km. NV Umeå (det. J. A. Nannfeldt).

Umeå, Sverige, december 1954. L. Hjortsberg.

Sjældnere Svampefund i Danmark i 1954. 1. Volvaria murinella, Københavns Alle, Jægersborg Dyrehave, Vejrand under Fagus silvatica 5.9.1954.

2. Polyporus fomentarius paa Quercus robur, Ndr. Eremitagevej, Jægersborg Dyrehave, 19.9.1954.

3. Amanita junquillea under Pinus silvestris i Sandflugtsplantage, Snogebæk, Bornholm. — Straagul Fluesvamp maa være et godt Navn til denne Svamp, der er karakteristisk ved Hattens friske gule Farve.

København, December 1954. K. Bjørnkær.

MEDDELELSER

fra

FORENINGEN TIL SVAMPEKUNDSKABENS FREMME.

MYKOLOGISK KONGRES I VINTRE MØLLER 12.—14. SEPTEMBER 1952

Årets mykologiske kongres blev afholdt i Studenterhytten i Vintre Møller ved Bramsnæs Vig den 12.—14. september. Kongressen havde denne gang en mere international karakter. Fra Sverige deltog professor J. A. Nannfeldt, Uppsala, der var kongressens hædersgæst. Fra Svejts deltog Pyrenomycet-specialisten, dr. E. Müller, Zürich, og endvidere besøgtes kongressen af den engelske plantepatolog, Mr. Townrow. De danske deltagere var: K. Bjørnekær, N. F. Buchwald, Knud Christensen, M. P. Christiansen, Erik Bille Hansen, E. Hellmers, Erik Jørgensen, A. B. Klinge, M. Lange, A. Munk, F. H. Møller, V. Pedersen og F. Terkelsen. Desværre havde vor nestor, dr. med. V. Hertz i sidste øjeblik måttet melde afbud.

Lørdag den 13. september besøgte man om formiddagen Ordrup Skov. Denne skov er overvejende løvskov med bøgebestande på middelgod muld, hist og her med lidt eg iblandet, og på fugtig bund med ask og el. Der var kun enkelte granområder. Svampefloret var ret beskedent, men dog ikke ganske uden interesse. Der noteredes ialt 140 Arter, hvoriblandt kan nævnes: *Agaricus comtulus, fusco-fibrillosus, leucotrichus, semotus; Collybia fusipes; Coprinus cortinatus, domesticus, narcoticus, velox; Conocybe pygmaeo-affinis, siliginea; Helvella atra, ephippium; Hypholoma radicosum; Hypocrea citrina, viridis; Hypomyces aurantius* på *Polyporus varius; Russula sororia; Spinellus fusiger* på *Collybia dryophila.*

Om eftermiddagen besøgtes Strandskov. Der var her en så absolut mangel på svampe — både i løvskov og i nåleskov —, at en udtalt pessimisme bredte sig over selskabet. Der noteredes 92 arter — langt de fleste i enkelte eksemplarer; kun enkelte arter skal nævnes her: *Agaricus leucotrichus, Merulius rufus, Mycena fellea, Polyporus obliquus* på *Fagus* og *Russula Velenovskyi.* Nogle af deltagerne flygtede i fortvivlelse til Eriksholm Skov, uden dog heller her at finde særlig opmuntring; kun *Geaster fimbriatus* og *Lepiota gracilis* er at nævne herfra.

Søndag den 14. september kørte man til Hvalsø-skovene, hvor man blev behageligt overraskede over et langt rigere svampeflor. Man afsøgte især skovpartierne omkring Avnsø, dels højbøgeskov og nogle mere blandede bestande, dels nogle fugtige ellekrat på søbredden. Blandt de noterede 184 arter kan f. eks. nævnes: *Agaricus caerulescens, lucorum, pulchellus; Hebeloma fastibile, longicaudum, varia Kunzei; Coprinus silvaticus (tardus); Cortinarius claricolor, caerulescens, lucorum, pulchellus; Hebeloma fastibile, longicaudum, truncatum; Hygrophorus penarius; Hypocrea pulvinata; Inocybe geophylla* var. *lateritia, posterula; Lactarius lilacinus, L. pyrogalus; Mycena pterigena, luteo-alba* var. *citrinomarginata; Pluteus gracilis; Psathyra coprobia; Rhodophyllus (Claudopus) byssisedus, Rh. (Leptonia) euchrous; Tuber dryophilum;* endvidere *Rosellinia aquila* på *Fagus.*

Selv om studenterhyttens naturhistoriske laboratorium endnu ikke var færdigmonteret, fik man dog indrettet sig med ret gode laboratorieforhold, der gjorde det muligt at arbejde en del med det indsamlede materiale. Kongressens totaludbytte blev ca. 280 arter samt en del Discomyceter, som professor Nannfeldt venligst påtog sig at bestemme. En liste over disse bestemmelser vil fremkomme senere. Også en del *Aphyllophorales* blev hjembragt af professor Nannfeldt til videre bearbejdelse. Nedenfor hidsættes en liste over disse arter, bestemt af John Eriksson, Uppsala.

Signatur: O.: Ordrup Skov; H.: Hvalsø-skovene; S.: Strandskov. Numrene er J. A. Nannfeldt's indsamlingsnumre.

Coniophora arida (Fr.) Karst., vejkant, på nøgen jord, O (12555); *Corticium atrovirens* (Fr.) Fr., *Fagus,* H (12613); *C. fumosum* (Fr.) Fr., *Fagus,* H (12617); *C. Sambuci* (Pers.) Fr., O (12571); *Sambucus nigra,* Vintre Møller, ved bækken (12625; 12626); *C. tulasnelloideum*

v. Höhn. & Litsch., *Fraxinus*, O (12557 b; 12572); *Craterellus tubiformis* (Bull. ex Fr.) Fr., på rådden stub, H (12608); *Glococystidium roscocremeum* (Bres.) Brinkm., *Fagus*, S (12589); *Mycoacia uda* (Fr.) Donk., *Fagus*, O (12563, 12568); *Mycoleptodon ochraceum* (Pers. ex Fr.) Pat., *Fagus*, O (12569 a); *Odontia bicolor* (A. & S. ex Fr.) Quél., *lign. conif.*, H (12615); *Pellicularia pruinata* (Bres.) Rogers., *Fagus*, H (12605); *Peniophora hydnoides* Cke & Massee., O (12551 b), *Fraximus?* (12582); *P. incarnata* (Pers. ex Fr.) Karst., *Fagus*, H (12606); *Polyporus betulinus* Bull. ex Fr., *Betula*, H; *P. caesius* Schrad. ex Fr., *Fagus*, O (12554); *P. gibbosus* Pers. ex Fr., *Fagus*, S. (12594); *P. versicolor* L. ex Fr., *Fagus*, H (12414); *P. versiporus* Pers., *Fagus*, O (12553), *Fagus*, S (12591); *Poria cupora* (Karst.) Cke., *Fagus*, H (12610); *Tomentella Bresadolae* (Brinkm. ap. Bres.) B. & G., *Fagus?*, H (12620); *T. fusca* (Pers. ex Fr.) Schroet., H. (12619); *Vararia investiens* (Schw.) Karst., *Fagus*, O (12565).

Lørdag aften hengav man sig til diskussion af en række forslag til danske navne til de „nye" slægter. Der herskede en bredt nuanceret uenighed om disse slægters værdi. Derimod enedes man let om at holde næste kongres i Københavns-egnen, og om en passende fordeling af de midler, som „Jakob E. Langes Fond" havde stillet til rådighed for kongressen.

Morten Lange.

GENERALFORSAMLING I 1953

Onsdag den 25. Februar 1953, Kl. 20^{00}, afholdtes Foreningens ordinære Generalforsamling i Botanisk Laboratoriums Auditorium, Gothersgade 140, København. — Ca. 40 Deltagere.

Professor D. Müller valgtes til Dirigent.

1. Formanden, Professor N. Fabritius Buchwald aflagde derpaa Beretning for Aaret 1952. Foraarsturen til Boserup Skov gav et Par Kurve fulde af Spiselig Morkel, og endvidere samledes en Del Vaarmusseroner og enkelte Blod-Champignoner *(Psalliota Langei)*. Efteraarssæsonen maatte absolut siges at ligge under Middel, navnlig August-September (for tørt Vejr?). Floret kulminerede først omkring 1. Oktober; paa Tisvildeturen den 28. September fandtes saaledes 176 Arter, incl. resupinate Former. Den 24. August indledtes Sæsonen med en Bustur til Brødeskov og Uggeløse Skov (ca. 50 Deltagere). Begge Skove bestaar af ældre Bøg; kun 89 Arter fandtes og kun faa Individer.

Den dominerende Spisesvamp var Rødmende Fluesvamp og det interessanteste Fund Foldtrøffel *(Hydnotrya Tulasnei)*. Den 7. September i Turistbil til Hallands Väderö (53 Deltagere), en meget smuk og interessant Tur; særlig interessant var de vidtstrakte Enebærkrat paa Øens Nordside og den smukke Bøgeskov, „Sønderskoven", paa Øens sydlige Del. Svampeudbyttet var ikke stort, størst i „Sønderskoven", ialt 97 Arter. Fremhæves maa *Auricularia auricula Judae* (Judasøre), *Boletus castaneus*, den i Danmark meget sjældne *Hygrophorus caprinus* (Sodbrun Vokshat), *Trichoglossum Walteri**) og *Amanita virosa* (3 Eksemplarer), samt af Spisesvampe den hyppige Rufodet Rørhat. Den 21. September gik Turen til vor Foraarslokalitet Boserup Skov for at se, hvordan Svampefloret her tog sig ud om Efteraaret. Ruskregn bevirkede desværre, at kun 15 Deltagere mødte op. Baade Arts- og Individantallet var ringe. Af sjældnere Ting bør fremhæves *Tricholoma aurantium* og *Psalliota xanthoderma*, af Spisesvampe Kæmpestøvbold og Høstmusseron. Den 28. September var der Ekskursion til Tisvilde Hegn (43 Deltagere). Af Spisesvampe fandtes væsentligt Kantarceller og Rørhatte, og iøvrigt bør fremhæves *Amanitopsis strangulata* og de lokale Specialiteter *Hydnum ferrugineum*, *Tricholoma imbricatum* og *Nyctalis asterophora* paa *Russula adusta*.**) — Den sidste Tur gik til Ermelunden og Dyrehaven den 19. Oktober, vel den køligste Dyrehave-Ekskursion, Foreningen har afholdt i mange Aar (45 Deltagere). Der noteredes 169 Arter, men Individmængden var meget ringe; de hyppigste Spisesvampe var Taage--Tragthat, Blaa Hekse-ring-Ridderhat og Viol-Ridderhat. Blandt de andre Fund bør fremhæves *Lepiota fusco-vinacea*, *Marasmius prasiosmus*, *Mycena echinipes* og *Limacium leucophaeum*. Slør-Stinksvampen eftersøgtes, men fandtes ikke paa den kendte Lokalitet i Ermelunden. Nævnes bør ogsaa *Pleurotus ulmarius* paa gammel Bøg, vist nok ny Vært for Danmark for denne Art.

Der afholdtes ikke nogen Svampeudstilling i 1952, da Sæsonen ikke indbød dertil.

En mykologisk Kongres afholdtes Lørdag den 13. og Søndag den 14. September i den nye Studenterhytte ved Vintre Møller, Syd for Bramsnæsvig. Der deltog 16 Mykologer, deriblandt 3 Udlændinge:

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*) Se E. Bille Hansen: The Danish species of Geoglossum. Bot. Tids. 51: 18, 1954.

**) Se »Friesia« 3: 70, 77. 1944.

Professor J. A. Nannfeldt (Sverige), Dr. J. Müller (Schweiz) og Mr. Townrow (England). Man gjorde Ekskursioner dels til Skovene paa Bramsnæs Vigs Østside (Ordrup Skov, Strandskoven), der var meget fattige paa Svampe, dels til Hvalsø Storskov og Valborup Skov, som gav et pænt Udbytte. En fuldstændig Fortegnelse over Svampefundene foreligger endnu ikke*), men Artstallet naar langt fra op paa de 400—425 Arter, der fandtes ved Kongresserne paa Als i 1950 og i Ry 1951.

Af „Friesia" udsendtes Hefte 3 af Bd. 4. Den væsentligste Del af Heftet optages af 2. og sidste Del af Overlærer F. H. Møller's store Psalliota-Monografi, med 4 Farvetavler og 19 Tavler i Sort; kun ved økonomisk Støtte fra Carlsbergfondet har Foreningen været i Stand til at trykke disse kostbare Tavler. Psalliota-Monografien har faaet mange udenlandske Mykologer til at erkende „Friesia"s Eksistens og derved øget „Salgsposten" for 1952 til det ret store Beløb 1075 Kr., deraf alene de 1028 Kr. for Salg af „Friesia", det største Beløb, Foreningen endnu har indkasseret paa et Aar ved Salg af Hefter. Det var Tanken i Løbet af 1953 at udgive et Dobbelthefte, omfattende Hefte 4 og 5 af Bd. 4 og gældende for baade 1952 og 1953, idet Foreningens Økonomi ikke tillod at udsende noget Hefte i 1952.

I Januar udkom den nye Udgave af J. Schäffer's Russula-Monografi med 20 smukke Farvetavler**). Foreningen skaffede sig ved Velvilje fra Forlagets Side ti Eksemplarer til Favørprisen 68 DM = 115 d. Kr. (en Prisreduktion paa ca. 30 Kr.); de blev hurtigt udsolgt. Et Eksemplar skænkedes af Foreningen til vor store Russula-Kender, vor Næstformand, Dr. med V. Hertz, da han erhvervede den medicinske Doktorgrad.

Af „Flora Agaricina Danica" solgtes i 1952 ialt 26 Stk. (1951: 23; 1950: 7; 1949: 27), hvilket betyder, at Foreningen, d. v. s. „Flora Agaricina Danica-Fondet", kan gøre Regning paa ca. 2000 Kr.

Bestyrelsen tildelte det for 1952 til Raadighed staaende Beløb af „Flora Agaricina Danica-Fondet", nemlig 500 Kr., til fhv. Viceskoleinspektør M. P. Christiansen til en Studierejse til Uppsala for at studere resupinate Hymenomyceter.

Den bekendte Uppsala-Mykolog, phil. dr. Seth Lundell fyldte 60 Aar den 17. April 1952 og modtog i den Anledning en Blomsterhilsen fra Foreningen.

Den aarlige Understøttelse paa 1000 Kr., som Foreningen plejer

*) Se dette Hefte S. 115—117.
**) Se »Friesia« 4: 221, 1952.

at modtage fra Undervisningsministeriet, var endnu ikke ankommet, men Finansaaret var jo heller ikke udløbet.

Der havde i 1952 indmeldt sig 49 Medlemmer og udmeldt sig 46. Foreningen havde pr. 31.12.1952 ialt 551 Medlemmer, heraf 84 Udlændinge.

Følgende Medlemmer var afgaaet ved Døden: Den norske Mykolog, Agent Chr. Bøhme (indmeldt 1938), der er kendt som Grundlæggeren af Oslos „Soppkontroll"*), og Greve Ernst Moltke (indmeldt 1908), et af Foreningens allerældste Medlemmer.

Æret være deres Minde!

2. Kassereren, Overlærer K. Bjørnekær aflagde Beretning: Regnskabet balancerede med 9440,57 Kr.; Kontingenter: 2645,86 Kr.; Renter: 47,63 Kr. og Salg („Friesia" og „Meddelelser"): 1075 Kr. Der var udbetalt til Bogtrykkeren („Friesia"): 3556,10 Kr.; Gæld til samme: 3326,00 Kr. Kassebeholdningen var pr. 31.12.1952: 1537,74 Kr.; paa Bankbogen henstod: 1408,94 Kr., og Restancer omfattede 244,00 Kr. „Flora Agaricina Danica-Fondet" opviste pr. 31.12.1952: 6019,03 Kr. — Efter at Regnskabet var gaaet rundt, blev der givet det Decharge.

3. og 4. Med Akklamation genvalgtes Bestyrelsesmedlemmerne: Professor N. F. Buchwald, cand. mag. E. Bille Hansen, Dr. med. V. Hertz, Retspræsident K. Mundt, samt Suppleanten, Dr. phil. M. Lange og Revisoren, Ekspeditionssekretær K. Rankov.

5. Paa Bestyrelsens Vegne foreslog Formanden følgende Ændring til Lovenes § 2: „Foreningens Hovedsæde er København. Det aarlige Kontingent er 6 Kr. for Medlemmer, der modtager „Meddelelser fra Foreningen til Svampekundskabens Fremme", og 10 Kr. for Medlemmer, der modtager „Friesia"." Forslaget motiveredes med de stadig stigende Udgifter til Trykning af „Friesia". Det var 6 Aar siden, Foreningen sidst havde forhøjet Kontingentet**). Forslaget vedtoges enstemmigt.

6. Følgende Ekskursioner foresloges. Om Foraaret: Boserup eller Ledreborg. Om Efteraaret: Møens Klint, Sverige, Mogenstrup Aas, Skovene ved Borup, Sorø og Bromme Plantage.

7. Eventuelt: Intet.

Hermed afsluttedes Generalforsamlingen, og Dirigenten takkedes med Akklamation af Forsamlingen.

(sign.) J. P. Jensen.

*) Se Nekrologen dette Hefte S. 104—105.
**) Se »Friesia« 3: 442 og 444, 1949.

Derpaa holdt Amanuensis, Forstkandidat E. Jørgensen følgende Foredrag med Lysbilleder: „Frugtlegemedannelse hos træboende Storsvampe". Et Referat af dette Foredrag er trykt i „Naturhistorisk Tidende" 18: 9—11, 1954.

Efter Mødet deltog en Del af Medlemmerne i det traditionelle „tvangfri Samvær" paa Universitetets Spisestuer, Nørregade 10.

E. Bille Hansen.

EKSTRAORDINÆR GENERALFORSAMLING I 1953

Paa Foreningens Foraarsekskursion til Boserup Skov Søndag den 10. Maj 1953 afholdtes umiddelbart efter Frokosten paa Restauranten „Skovly" en ekstraordinær Generalforsamling. 35 Deltagere.

Postmester J. P. Jensen valgtes til Dirigent.

Formanden, Professor N. F. Buchwald, forelagde Dagsordenens eneste Punkt, nemlig Ændring af Lovenes § 2 (jfr. dette Hefte, S. 120). Ændringen vedtoges enstemmigt, hvorefter § 2 har følgende Ordlyd:

„Foreningens Hovedsæde er København. Det aarlige Kontingent er 6 Kr. for Medlemmer, der modtager „Meddelelser fra Foreningen til Svampekundskabens Fremme", og 10 Kr. for Medlemmer, der modtager „Friesia"."

J. P. Jensen.

EKSKURSIONER I 1953.

Søndag den 10. Maj 1953. Ekskursion til Boserup Skov. 37 Deltagere, hvoraf 7 først stødte til ved Frokosten. Ekskursionen forløb efter de traditionelle Retningslinier. Svampefloret gjorde et meget tørt Indtryk, og der fandtes om Formiddagen kun yderst faa Svampe. Efter Frokosten, som fandt Sted paa „Skovly", afholdtes en kortvarig, ekstraordinær Generalforsamling, paa hvilken en Lovændring vedtoges.*) Derefter spadserede en Del af Deltagerne ned til Stranden, hvor det kølige, ret blæsende Vejr dog ikke indbød til noget længere Ophold. Hjemrejsen fra Roskilde fandt Sted ved 16-Tiden.

Der samledes adskillige Eksemplarer af Spiselig Morkel *(Morchella esculenta)*, 3—4 Hættemorkler *(Morchella rimosi-*

*) Se nærmere ovenfor.

pes), ikke faa Vaarmusseroner *(Tricholoma gambosum)*, samt enkelte Blod-Champignoner *(Psalliota Langei)* (det. F. H. Møller).

Af Storsvampe noteredes ialt 19 Arter, nemlig foruden de nævnte følgende: *Collybia dryophila*, et Par Eksemplarer; *Coprinus atramentarius, disseminatus, micaceus; Discina ancilis*, 1 Eksemplar; *Entoloma clypeatum*, adskillige Eksemplarer flere Steder; *Pholiota mutabilis, togularis; Polyporus applanatus* paa Stød af *Ulmus, P. fulvus* paa Blommetræ i Restaurationshaven til „Skovly", *P. squamosus*, et Par Steder ved Grunden af *Fraxinus, P. ungulatus* paa *Picea abies; Psathyra obtusata; Psalliota bispora* paa Halm og Affald; *Stereum rugosum* paa *Corylus*.

N. Fabritius Buchwald.

Søndag den 30. August 1953. Ekskursion til Bøndernes Hegn og Hareskov. 60 Deltagere. I et smukt og varmt Vejr gennemførtes Turen efter Planen, idet man om Formiddagen gik langs Bagsværd Sø og rundt Hul Sø op til Restaurant „Bøndernes Hegn". Efter Frokostpausen her gennemgik Amanuensis E. Bille Hansen det foreløbige Udbytte, og man fortsatte derefter ad Femvej — Gl. Jagtvej gennem Hareskov til Hareskov Station.

Det almindelige Indtryk af Svampefloraen maa nærmest betegnes som skuffende, mest paa Grund af det ringe Individantal. Det lykkedes kun faa Deltagere at samle en antagelig Portion Spisesvampe, flest Kantareller, enkelte Champignoner og enkelte Eksemplarer af Spiselig Rørhat.

I Følge Lister udfærdigede af Amanuensis E. Bille Hansen, Hr. J. P. Jensen og M. P. Christiansen samt egne Notater blev der ialt fundet 150 Arter. Heraf kan fremhæves følgende:

Boletus pachypus, parasiticus (paa *Scleroderma aurantium* fra det kendte Voksested i den moseagtige Sænkning kort før Savværket ved Hareskov St.); *Clavaria stricta* (særlig kraftige Grupper paa Savsmuld); *Cortinarius delibutus* under *Betula; Flammula limulata; Galera appendiculata; Hebeloma sacchariolens; Lactarius cyathula* under *Alnus glutinosa; Lenzites abietina; Lepiota echinella, seminuda; Mycena dilatata; Naucoria scolecina* under *Alnus glutinosa; Omphalia umbilicata; Phallus caninus; Pholiota flammans, radicosa; Pluteus leoninus* (taget paa det lave Terrain ved Hul Sø, leg. Fru Elisabeth Andersen); *Polyporus odoratus; Psalliota abruptibulba; Tricholoma flavobrunneum.*

Af Hr. M. P. Christiansen blev noteret følgende 7 resupinate Arter: *Gloeocystidium citrinum; Grandinia farinacea; Odontia crustosa, hydnoides, lactea; Peniophora setigera; Poria sanguinolenta,* samt 3 Slimsvampe: *Arcyria incarnata, Fuligo septica* og *Tubulina cylindrica.*

Endelig foreviste Hr. J. E. Bregnhøj Larsen foruden *Boletus parasiticus* ogsaa en stor Sjældenhed, nemlig *Gomphidius gracilis;* den sidstnævnte Art er kun fundet et Par Gange før i Danmark. Begge Arter var samlet i Tokkekøb Hegn.

K. Bjørnekær.

Søndag den 13. September 1953. Ekskursion til Møens Klint. 23 Deltagere. Vejrberetningen Lørdag Aften var meget ugunstig. Dobbelt velkommen var derfor det smukke Vejr, som herskede under hele Turen. Det var sikkert en medvirkende Aarsag til, at Dagen bragte Deltagerne en virkelig Oplevelse. Alt var med os, lige undtagen Svampene. Det viste sig atter denne Gang, at Svampefloret var ringe, kun enkeltforekommende Eksemplarer, ingen Flokke.

Naar der alligevel blev fundet saa mange Arter, ca. 180, maa det tilskrives den Iver og Interesse, som Deltagerne lagde for Dagen under Eftersøgningen.

Ekskursionen begyndte med et Kvarters Forsinkelse. Et Medlem udeblev uden nærmere Meddelelse.

Ved Rønnede Kro rastede man en halv Time, hvorefter Rejsen fortsattes mod Klinten. I Sænkningen før denne iagttoges med — i hvert Tilfælde ydre — stoisk Ro nogle indhegnede lave Græsarealer, der var plettet af store, hvide Champignoner. Ankomst til Hotel „Storeklint" Kl. 10,15.

Efter Frokosten gik nogle af Deltagerne paa egen Haand til fjernere Dele af Klinteskoven, medens Hovedparten søgte i den Del, der ligger i Nærheden af Hotellet, hvor Skoven overvejende bestaar af forholdsvis ung Bøg. Der afsluttedes med en samlet Gennemgang af Fundene ved Overlærer F. H. Møller.

Efter indbyrdes Aftale rykkedes Middagen paa Hotellet en Time frem, nemlig til Kl. 17, og man kunde derfor slutte den smukke Tur Kl. 21,30 paa Raadhuspladsen.

Af Dagens Fund bør fremdrages følgende Arter:

Amanita strobiliformis. Sjælden i Skove, men fundet flere Gange i lollandske Herregaardsparker. Den ligner paa Grund af Hudlapperne meget en stor, hvid *A. mappa,* men har meget højt siddende Ring, og Stokken er dybt rodfæstet og uden tydelig Skede. Skal være spiselig

(F. H. M.); *Boletus radicans* i Gruppe paa Græsplæne ved Hotellet; *Clavaria flava* (den ægte Friesiske Art af dette Navn har Prof. Nannfeldt overgivet F. H. Møller; den rødmer ikke i Stokkødet, men har samme Farve, Form og Størrelse; den rødmende Art bliver nu ofte kaldt *Clavaria sanguinea* Pers.); *Cordyceps militaris; Cortinarius aurantio-turbinatus, bovinus* sensu Lange, *C. cotoneus* sensu Lange, *C. claricolor, cyanopus* (forekom flere Steder i Bøgeløvet og varierede en Del i Farve; ved Stokbasis havde den Tilløb til en lille Skede — se Lange's Billede), *C. sulphureus* var. *citrinus, tophaceus; Crepidotus cinnabarinus* blev fundet nær Sommerspiret, hvor den tidligere er iagttaget*); *C. calolepis,* der foretrækker at vokse paa *Populus tremula,* nær beslægtet, men ikke identisk med *C. mollis; Galera pygmaeo-affinis; Geaster fimbriatus* under *Fagus; Hebeloma longicaudum; Hydnum nigrum, zonatum; Hygrophorus constans; Hypholoma melanthinum* (det fundne Knippe havde brede Hatskæl; saadanne Individer bliver nu ofte kaldt *H. scobinaceum* eller *H. maculatum* Peck. Fries's Billede af *H. melanthinum* har finere, haaragtige Skæl); *Inocybe geophylla* var. *lateritia, hirsuta, sindonia, Trinii; Lepiota granulosa, rufescens, umbonata; Limacium pudorinum* (der blev kun fundet eet Frugtlegeme; en anden Art, der mest vokser i Naaleskov og har livligere Farver, kaldes af franske Forfattere *H. pudorinum* = *H. glutiniferum* sensu Ricken, og R. Heim har givet den danske Art fra Bøgeskov Navnet *L. poctarum); Marasmius foetidus, globularis; Peziza coccinea* (ellers Foraarssvamp); *Pholiota spectabilis, Pluteus ephebeus* (det. F. H. Møller; Arten har mørkebrun Hat, hvis Overhud er meget tilbøjelig til at sprække radiært, som visse *Inocybe*-Arter; den er fundet paa Lolland-Falster i de sidste 30 Aar, men kun faa Gange), *P. salicinus; Psalliota edulis, squamulifera; Polyporus melanopus; Russula aurata; Schizophyllum alneum; Tricholoma murinaceum, saponaceum* var. *cnista.*

Endvidere noterede Hr. M. P. Christiansen 16 af ham bestemte resupinate Arter inden for Slægterne: *Corticium, Grandinia, Odontia, Peniophora* og *Tomentella.*

Under Demonstrationen forevistes yderligere et Eksemplar af *Entoloma lividum* fra Grønved Skov, Møen (leg. F. H. Møller).

Ovenstaaende Artsliste med indføjede Bemærkninger bygger i væsentlig Grad paa Oplysninger modtaget fra Overlærer F. H. Møller og Postmester J. P. Jensen.

K. Bjørnekær.

*) Se »Friesia« 3: 94—95 og 217—220

Søndag den 20. September 1953. Ekskursion til Gribskov. Ca. 75 Deltagere. Efter Ankomsten til Storkevad ved Halvtitiden gik man først lidt mod Vest og saa mod Syd, passerede derefter Jernbanelinien, fortsatte nu ad Stutterivej, Øst for Multebjerg, derpaa ad Skovportevej, forbi „Kommunikationshuset" og naaede endelig Skovløberhuset ved St. Gribsø Kl. 12^{30}. Her spistes Frokosten og demonstreredes Formiddagens Svampeudbytte. Ved Halvtretiden fortsattes Ekskursionen. Man gik først Vest om Gribsø, derpaa mod Syd ad Gribsøvej og bøjede derefter mod Øst til „Ottevejskrydset". En Del af Deltagerne spadserede nu til Kildeport, hvorfra de tog hjem med Toget, medens de fleste gik videre ad Oddervej til Frederiksborgvej og derpaa til Slotspavillonen's Trinbræt, hvorfra Hjemrejsen fandt Sted Kl. 17^{36}; i København Kl. 18^{41}.

Der noteredes et meget stort Artsantal, nemlig 227 Arter, hvoraf godt og vel 3/4 var Blad- og Rørhatte.

Af Spisesvampe fandtes navnlig mange Eksemplarer af Karl Johan-Rørhat, Rustokket Rørhat, Rødmende Fluesvamp og Foranderlig Skælhat, men kun faa Skov-Mandelchampignoner, Kantareller og Pigsvampe.

Blandt de hyppigste Arter var i øvrigt *Amanita mappa,* baade den typiske Form og var. *alba,* og *Cortinarius semisanguineus.*

I det følgende skal nævnes en Del af de fundne Arter.

Myxomycetes: *Fuligo septica; Lycogala epidendron.*

Ascomycetes: *Geoglossum viride; Helvella crispa; Leotia lubrica.*

Tremellales: *Exidia pithya* paa *Picea abies.*

Aphyllophorales: *Coniophora arida* paa *Picea abies; Corticium atrovirens, croceum; Hydnum repandum,* flere Steder; *Lenzites abietina* og *L. saepiaria,* begge paa *Picea abies, L. betulina* paa *Fagus; Merulius tremellosus* paa en stærkt trøsket, væltet Bøgestamme; *Peniophora quercina* paa *Quercus; Polyporus abietinus* paa *Picea abies,* den sjældne *P. borealis,* flere taglagt stillede Individer paa Stød af *Picea abies, P. odoratus* paa stort Stød af *Picea abies, P. perennis,* adskillige Steder, *P. Pfeifferi* (sædvanligvis i Danmark kaldt *P. cupreo-laccatus),* mange friske Frugtlegemer ret højt op ad endnu levende, men stærkt medtaget Bøg ved Gribsø, *P. Schweinitzii* og *P. ungulatus,* begge paa Stød af *Picea abies, P. versicolor* paa nedfalden Gren af *Betula; Ptychogaster albus,* dels paa Stød, dels paa Gren af *Picea abies; Stereum sanguinolentum* paa *Picea; Thelephora palmata* under *Picea abies.*

Agaricales: *Boletus appendiculatus, badius,* tostokket Eksemplar, den sjældne *B. cavipes,* 3 Individer under *Larix, B. elegans,* adskillige Eksemplarer, *B. miniatoporus, pachypus (calopus), B. scaber,* grønlig i Stokken.

Amanita pantherina, phalloides, 2 Eksemplarer, *A. porphyrea, spissa,* flere Eksemplarer, *A. vaginata,* dels den typiske graa Form, dels var. *fulva; Armillaria mucida,* et meget stort Frugtlegeme; *Cantharellus aurantiacus* i Savsmuld, *C. tubaeformis,* ret alm.; *Clitocybe dicolor, laccata* var. *proxima, nebularis; Collybia dryophila; Cortinarius**) alboviolaceus, anomalus, armillatus* ved Gribsø, *C. bolaris, caninus, calochrous,* flere Eksemplarer, *C. cinnamomeus, cinnamomeus* var. *croceus, collinitus, elatior, malicorius, semisanguineus,* alm., *C. vibratilis; Entoloma sericellum, sericeum; Flammula lenta, penetrans; Galera hypnorum; Gomphidius glutinosus; Hebeloma crustuliniforme, longicaudum, sinapizans; Hygrophorus citrinus, coccineus, miniatus; Hypholoma dispersum, lacrymabundum; Inocybe geophylla; Lactarius camphoratus, deliciosus,* ret alm., *L. glyciosmus, quietus, pallidus, rufus,* flere sammenvoksede Individer, *vellereus; Lepiota carcharias; Limacium agathosmum, olivaceo-album, pustulatum, tephroleucum; Marasmius Bulliardii* paa fjorgamle Blade af *Quercus borealis, M. oreades; Mycena galopus, haematopus, inclinata* forma (uden rød Stok), *M. rorida; Nolanea staurospora; Omphalia fibula; Panaeolus campanulatus; Panus conchatus; Paxillus involutus* paa nedfalden Kogle af *Picea abies, P. rhodoxanthus (Phylloporus paradoxus),* 2 Frugtlegemer (Hatdiameter 3 og 4 cm) i Sand langs Vejskraaning, Ekskursionens interessanteste Fund; *Pholiota caperata,* adskillige Eksemplarer, *P. radicosa* og *P. spectabilis,* begge paa *Fagus; Pluteus salicinus (rigens),* flere Individer; *Psalliota abruptibulba* (Syn. *P. silvicola* sensu F. & W.), enkelte Eksemplarer, *P. silvatica; Psathyrella gracilis, impatiens; Psilocybe elongata* ved Gribsø; *Russula aeruginea, claroflava, depallens, gracillima* under *Betula* ved Gribsø, *parazurea, puellaris, Velenovskyi; Stropharia squamosa; Tricholoma aggregatum, nudum, pessundatum, psammopus, saponaceum* var. *cnista, ustale; Tubaria inquilina.*

Gasteromycetes: *Cyathus crucibulum; Lycoperdon echinatum,* 1 Eksemplar, *L. nigrescens; Phallus caninus; Scleroderma aurantium.*

Ekskursionen var begunstiget af Tørvejr, selv om den stærke

*) Alle paa Ekskursionen noterede *Cortinarius*-Arter nævnes.

Taage, der havde hersket om Natten, endnu ikke var helt lettet, da man ankom til Storkevad. Ved 11-Tiden brød Solen imidlertid frem og skinnede nu Resten af Dagen, og det var saa mildt, at man kunde sidde ude og spise Frokosten.

N. Fabritius Buchwald. E. Bille Hansen.
J. P. Jensen.

Søndag den 4. Oktober 1953. Ekskursion til Mogenstrup Aas. 51 Deltagere startede i to Turistbiler Kl. 8^{00} fra „Den lille Hornblæser" ved Raadhuspladsen og ankom Kl. ca. 10^{30} til Mogenstrup Kro, hvor flere Deltagere fra Sydsjælland og Lolland-Falster sluttede sig til. Resten af Formiddagen gik med Afsøgning af Stenskov Nord for Kroen. Under Frokosten demonstrerede Overlærer F. H. Møller et Par interessante medbragte Svampearter, nemlig *Lepiota naucina* med et mindre Frugtlegeme i normal Superposition paa det større Frugtlegeme og adskillige store, smukke, endnu lukkede Eksemplarer af den af Tang eller Fisk lugtende *Psalliota Bernardii* (Strand-Champignon). Efter Frokosten afsøgtes den Del af Mogenstrup Aas, der strækker sig mellem Landsbyerne Mogenstrup og Rønnebæk, og som omfatter bl. a. de kendte Fladsaa Bakker og Løjetskov. Skovene bestaar overvejende af Rødgran, der her og der er isprængt Løvtræpartier, især af Bøg. Ved Halvfemtiden tog Københavnerne nær Rønnebæk Afsked med de øvrige Deltagere og ankom til København Kl. ca. 18^{30}.

Svampeudbyttet var meget stort og beløb sig til 242 Arter (incl. resupinate Arter), vist det største Artsantal, der er noteret paa Foreningens Ekskursioner.

Af Spisesvampe, der samledes, kan navnlig nævnes følgende: Honningsvamp, der var meget almindelig, Rabarber-Parasolhat, Alm. Pigsvamp, Taage-Tragthat og Violet Heksering-Ridderhat; de to sidste Arter var begge hyppige. Andre Svampe, der optraadte i Mængde, var f. Eks.: *Clitopilus prunulus, Hypholoma sublateritium, Mycena pura* og *Paxillus involutus.*

Stenskov (Rødgran og Bøg): *Clitocybe dicolor, geotropa; Coniophora arida; Coprinus narcoticus* (det. M. Lange); *Crepidotus variabilis* paa døde *Urtica*-Stængler; *Cyathus striatus; Helvella crispa; Hydnum zonatum* i Mængde under *Picea abies; Lenzites abietina,* lange, bændelformede Frugtlegemer paa kasserede, stærkt frønnede

Ledningsmaster; *Lepiota carcharias, clypeolaria, seminuda, umbonata* under *Picea abies; Limacium pustulatum; Lycoperdon saccatum; Merulius rufus* paa *Quercus; Mycena polygramma, zephirus; Nectria peziza* paa *Fagus; Peziza onotica; Pholiota marginata; Pleurotus ostreatus* paa *Populus* langs Vej; *Polyporus annosus,* hyppig, *P. applanatus* paa Stød af *Ulmus, P. fulvus* paa flere Blommetræer i Have; *Poria sanguinolenta* paa trøsket Træ; *Psalliota fusco-fibrillosa* (det. F. H. Møller), *Ps. silvatica; Russula xerampelina; Scleroderma verrucosum; Stropharia caput Medusae; Tricholoma aggregatum, myomyces, vaccinum* under *Picea abies, T. nudum,* smuk Superposition i normal Stilling.

Fladsaa Bakker*), Løjetskov m. m.: *Aleurodiscus amorphus* paa Stænger af *Abies alba* (F. B.), *Amanita phalloides,* enkelte Individer, *A. spissa; Bolbitius vitellinus; Boletus elegans, luteus* under *Pinus silvestris* (F. B.); *Bovista plumbea* (F. B.); *Clavaria corniculata, cristata, dissipabilis* (F. B.), *C. ochraceo-virens, stricta; Clitocybe cerussata, dealbata, dicolor, geotropa, obsoleta, tortilis; Collybia radicata* med næsten sort Lameleg, *C. tenacella; Coprinus comatus, plicatilis; Cortinarius decoloratus, decipiens, infractus, tabularis; Entoloma nidorosum, rhodopolium, sericeum; Galera teneroides; Geaster fimbriatus; Gomphidius viscidus* (F. B.); *Hebeloma fastibile, longicaudum, mesophaeum, strophosum; Hygrophorus chlorophanus, citrinus, coccineus, nigrescens, nitratus, pratensis, psittacinus, puniceus, russocoriaceus, virgineus* (alle *H.*-Arter paa F. B.); *Hypholoma cotoneum; Inocybe geophylla* var. *lilacina, I. rubescens; Lactarius aurantiacus, glyciosmus, pallidus; Lentinus cochleatus; Lepiota cristata, procera; Leptonia chalybaea, lampropus, serrulata* (alle *Leptonia*-Arter paa F. B.); *Limacium hypothejum; Marasmius cohaerens, globularis; Mycena crocata, metata; Naucoria cucumis* var.; *Nolanea papillata, staurospora; Omphalia fibula; Paxillus Alexandri, tricholoma; Pholiota destruens* paa *Populus, Ph. filaris, squarrosa* ved Grunden af *Prunus avium* („Spansk Kirsebær"); *Pleurotus rhacodium* (det. J. P. Jensen); *Polyporus brumalis, fumosus* paa *Fagus, P. versicolor* paa *Fraxinus; Psalliota cupreo-brunnea, Langei, nivescens, semota, spissa* (alle *Ps.*-Arter det. F. H. Møller); *Psathyra fusca; Psathyrella disseminata, gracilis; Russula atropurpurea, livescens, nauseosa, sardonia* med kraftig rød Stok, *R. vesca; Sparassis crispa; Stropharia coronilla, separata, squamosa* var. *thrau-*

*) I det følgende forkortet til F. B.

sta; Thelephora palmata; Tremella simplex Jacks. & Martin paa *Aleurodiscus amorphus* (ny Art for Landet*); *Tricholoma aurantium, carneum, lascivum, melaleucum; Volvaria speciosa.*

Endvidere fandtes følgende 15 resupinate Hymenomyceter (alle det. M. P. Christiansen): *Corticium confine, pruina, tulasnelloides* (alle paa *Fagus); Grandinia farinacea (Picea); Mycoleptodon ochraceus (Fagus); Odontia bicolor (Picea), O. hydnoides (Fagus); Peniophora byssoides (Picea), gigantea (Picea), incarnata (Fagus), longispora, lycii (Fagus), polonensis* (raaddent Træ), *pubera* (raaddent Træ), *quercina (Fagus).*

Endelig noteredes Myxomyceten *Trichia decipiens.*

N. Fabritius Buchwald. J. P. Jensen.
F. H. Møller.

Søndag den 18. Oktober 1953. Ekskursion til Jægersborg Dyrehave og Bøllemosen. 20 Deltagere. Man mødtes som sædvanlig Kl. 10^{00} ved Linie 14's nu nedlagte Endestation. Vejret var lunt, men Støvregn og Dis dominerede hele Dagen. Man enedes derfor om at afkorte Turen, saaledes at man efter at have besøgt „Vokshatteengen" ved Skovridergaarden gik mod Syd igen til „Kildekroen". Her afholdtes efter Frokosten en Demonstration af Dagens Fund, hvorefter ca. Halvdelen af Deltagerne gik til Kildesøen, hvor der i den store Brændenældebevoksning fandtes mange smukke Eksemplarer af *Pholiota aurea* og *Lepiota acutesquamosa,* samt nogle faa Eks. af *Geaster triplex.* Derefter gik man over Dyrehavsbakken til Klampenborg Station.

Den vedholdende Regn havde berøvet flere Svampe deres Hatbeklædning af Skæl, f. Eks. fremtraadte *Lepiota acutesquamosa* og *Pholiota adiposa* med nøgne Hatte, og *Coprinus atramentarius* blev fundet i en saa sælsom Skikkelse, at den fejlagtigt blev antaget for at være *Coprinus insignis,* hvis Forekomst i Danmark først var blevet erkendt den foregaaende Søndag (11. Oktober 1953)**).

Af de paa Ekskursionen noterede 125 Arter Storsvampe skal fremdrages følgende:

Boletus edulis; Clavaria helvola Pers. *(Cl. inaegualis* F. et W. = *Cl. dissipabilis* Britz., det. Bille Hansen), *corniculata, luteo-alba* Rea (det. Bille Hansen); *Clitocybe connata, dicolor, rivulosa* (knippe-

*) Se nærmere dette Hefte S. 60.
**) Se dette Hefte S. 131.

voksende); *Coprinus atramentarius, comatus, picaceus, plicatilis; Cordyceps militaris; Crepidotus mollis; Cyathus crucibulum; Galera clavata, Mairei, tenera; Geaster triplex; Geoglossum glutinosum* (det. Bille Hansen); *Hebeloma mesophaeum; Hydnum erinaceum, septentrionale; Hygrophorus chlorophanus, citrinus, coccineus, fornicatus, pratensis, psittacinus, puniceus, Reai, subradiatus, virgineus; Hypholoma hydrophilum; Inocybe asterospora, geophylla; Lepiota acutesquamosa; Mycena ammoniaca, capillaris, citrinomarginata, filopes, galopus, vitilis, zephirus; Nolanea papillata, staurospora; Omphalia fibula, griseo-pallida, pyxidata, Swartzii, umbilicata; Panaeolus (Psilocybe) foenisecii; Peziza aurantia, catinus* Holmskjold *(cupularis* sensu F. et W.); *Phlebia radiata; Pholiota adiposa, aurea, radicosa, squarrosa; Pleurotus ostreatus; Polyporus applanatus, brumalis, lucidus, Pfeifferi (cupreo-laccatus); Psalliota silvatica* forma; *Psilocybe sarcocephala; Russula cyanoxantha, grisea, lutea, veternosa, xerampelina; Stereum purpureum; Stropharia inuncta, semiglobata; Tricholoma cuneifolium, irinum, nudum; Tubaria furfuracea.*

Dagens interessanteste Svamp blev demonstreret af Fru Lisbeth Andersen. Det var den mærkelige, graabrunlige Navlehat *Omphalia belliae,* som vokser i Knipper paa vintertørre Stængler af Tagrør; den var fundet ved Gentofte Sø den foregaaende Dag.

J. P. Jensen. E. Bille Hansen.

MYKOLOGISK KONGRES I KØBENHAVN 10.—11. OKTOBER 1953

Kongressen afholdtes den 10.—11. oktober og havde hovedkvarter på Botanisk Laboratorium, København. Der var følgende 22 deltagere: K. Bjørnekær, N. F. Buchwald, K. Bülow, M. P. Christiansen, P. Grøntved, E. Bille Hansen, Lise Hansen, L. Harmsen, H. Hauerbach, E. Hellmers, St. Hertz, J. P. Jensen, A. B. Klinge, M. Lange, J. E. Bregnhøj Larsen, A. Munk, Ruth Munk, N. Juul Nielsen, V. Pedersen, J. Boye Petersen, F. Terkelsen og I. Weng.

Lørdag den 10. Oktober besøgtes Vallø Storskov. Svampefloret var nogenlunde rigt, og der noteredes ialt ca. 235 arter; en ikke uinteressant del af disse fandtes på græsgangene i Vallø park. Af bemærkelsesværdige fund kan noteres: *Agaricus (Psalliota) fuscofibrillosus, semotus; Cortinarius calochrous, porphyropus, tabularis;*

Flammula alnicola; Hygrophorus laetus, sciophanus, unguinosus; Hypocrea rufa; Lepiota acutesquamosa; Merulius rufus; Pluteus salicinus; Rhodophyllus ameides (i parken), *Rh. cordae, nitidum, Tricholoma psammopus, sordidum; Xylaria longipes.* Materialet blev gennemgået og indgående diskuteret eftermiddag og aften på laboratoriet, hvor man havde den glæde, at dr. V. Hertz kunne medvirke ved løsningen af *Russula*-problemer.

Søndag den 11. Oktober besøgtes Jægersborg Dyrehave, der endnu engang viste sin mykologiske rigdom for os. Der noteredes herfra 177 arter, hvoraf 82 ikke var blevet set i Vallø, så kongressens samlede artsliste blev på over 300 arter. Blandt fundene var ikke færre end 16 *Hygrophorus*-arter og — lige så påfaldende – ikke een art af slægten *Cortinarius.* Af de noterede arter kan nævnes *Coprinus insignis,* en art, der minder om *C. atramentarius,* men har ru sporer, og *Hygrophorus Schulzeri,* der fandtes i et enkelt exemplar. Desuden glædede man sig over stedets „usædvanlige sensationer": *Hydnum erinaceum* og *H. septentrionale, Phaeolepiota aurea* o. s. v., hvis voksesteder Hr. J. P. Jensen med vanlig sikkerhed kunne demonstrere for os.

Endnu engang kunne kongressen konstatere økonomisk medbør gennem et tilskud fra „Jakob E. Langes Fond".

Morten Lange.

GENERALFORSAMLING I 1954

Onsdag den 24. Februar 1954, Kl. 20^{00}, afholdtes Foreningens ordinære Generalforsamling i Botanisk Laboratoriums Auditorium, Gothersgade 140, København. — 62 Deltagere.

Hr. J. P. Jensen valgtes til Dirigent.

1. Formanden, Professor N. Fabritius Buchwald aflagde derefter Beretning for Aaret 1953. Foraarsturen gik som sædvanligt til Boserup Skov og fandt Sted allerede den 10. Maj (35 Deltagere). Der fandtes adskillige Morkler og navnlig mange Vaarmusseroner. Efter Frokost afholdtes med daværende Postmester J. P. Jensen som Dirigent en ekstraordinær Generalforsamling, paa hvilken Lovændringen om Kontingentforhøjelsen pr. 1. Januar 1954 enstemmigt vedtoges. Kontingentet er altsaa nu 6 Kr. for „Meddelelser" og 10 Kr. for „Friesia". — Efteraarssæsonen maa som Helhed karakteriseres som god, dog var den første Del af Sæsonen nok under Normalen, men til Gengæld var den sidste Del absolut over

Middel. Antallet af noterede Arter var meget stort paa alle Ture og varierede fra 125 til 242 Arter. — Den første Tur gik den 30. August til Bøndernes Hegn og Hareskov (60 Deltagere). Vejret var varmt og smukt, og der noteredes nøjagtigt 150 Arter. „Karl Johan" og Champignoner samledes kun i ganske faa Eksemplarer; derimod fandtes en Del Kantareller. Snylte-Rørhat (*Boletus parasiticus)* iagttoges paa den Lokalitet, hvor Svampen har været samlet hyppigt, siden Læge C. Mundt fandt den første Gang den 14. August 1910*). Tandlæge Bregnhøj Larsen forevistе den meget sjældne Slimslør-Art, *Gomphidius gracilis,* samlet i Tokkekøb Hegn Dagen før. — Den 13. September tog man med Bus til Møens Klint (kun 23 Deltagere). Straalende Vejr. 180 Arter noteredes. Fremhæves bør Fundene af *Amanita strobiliformis* og *Crepidotus cinnabarinus.* — Den 20. September gik Ekskursionen til Grib Skov (75 Deltagere). Taage om Formiddagen, men fra Kl. 11^{00} Solskin. 227 Arter noteredes. Af Spisesvampe fandtes især Rørhatte og Velsmagende Mælkehat, og af Sjældenheder bør fremhæves *Boletus cavipes, Polyporus borealis* og den ejendommelige „Rørhatagtig Netbladhat" *(Paxillus rhodoxanthus),* der er en Mellemting mellem en Bladhat og en Rørhat. — Den 4. Oktober tog man i Bus til Mogenstrup Aas (51 Deltagere). Artsantallet beløb sig til 242 Arter. Efter Frokosten demonstrerede Overlærer F. H. Møller smukke Eksemplarer af Strand-Champignon *(Psalliota Bernardii)* og Rosabladet Parasolhat *(Lepiota naucina).* Af de talrige Fund bør fremhæves den for Landet nye af M. P. Christiansen bestemte *Tremella simplex,* der vokser paa *Aleurodiscus (Corticium) amorphus***). — Den 18. Oktober fandt den sidste Tur Sted og gik som sædvanligt til „Dyrehaven". Paa Grund af det taagede og regnfulde Vejr deltog kun 20 Medlemmer. Der noteredes 125 Arter. Den interessanteste Svamp paa Ekskursionen var Tagrør-Navlehat *(Omphalia belliae),* der blev forevist af Fru Elisabeth Andersen, der Dagen før havde samlet den paa Tagrør ved Gentofte Sø.

I Dagene 10.—11. Oktober 1953 afholdtes „Mykologisk Kongres" i København med Ekskursion Lørdag den 10. til Vallø Storskov og Søndag Formiddag den 11. til Jægersborg Dyrehave. Der deltog 22 Mykologer. Det indsamlede Materiale behandledes paa Botanisk Laboratorium. Der noteredes ca. 235 Arter.

*) Se »Friesia« 2: 88. 1938.
**) Se nærmere herom dette Hefte S. 60.

En Svampeudstilling afholdtes fra Torsdag den 24. September til Søndag den 27. September i Haveselskabets Have. Udstillingen besøgtes af 1134 betalende Gæster, og Antallet af udstillede Svampe naaede op paa 277 Arter! Udstillingens „Clou" var den smukke, røde Fluesvamp, Kejsersvampen *(Amanita caesarea)*, som Professor D. Müller havde skaffet til Landet fra Nord-Italien pr. Flyvemaskine. Det er vist første Gang, at Kejsersvampen har været udstillet i Danmark.

Af „Friesia" udsendtes der et Dobbelthefte (Bind 4, Hefte 4—5), gældende for 1952 og 1953. Foreningen havde ikke haft Raad til at udgive noget Hefte i 1952. Vi haaber inden Aarets Udgang at kunne bringe Indholdsfortegnelse til det nu afsluttede Bind 4 og endvidere at udsende et Hefte for 1954.

Af „Flora Agaricina Danica" solgtes 31 Eksemplarer i Løbet af 1953, det største Antal i mange Aar. Det kan forventes, at der vil tilfalde Foreningen 2.500 Kr., som hensættes i „Flora Agaricina Danica-Fondet". Der bevilgedes Formanden 500 Kr. af Fondet til Deltagelse i den af „British Mycological Society" afholdte mykologiske Kongres i Skotland, September 1953, hvortil han var blevet indbudt.

I denne Forbindelse vil jeg gerne minde om, at Foreningen i 1955 har 50-Aars Jubilæum. Vi agter at festligholde det ved et flerdages Møde med Ekskursioner, Udstilling og Foredrag, hvortil Mykologer fra Udlandet, især Skandinavien, tænkes indbudt. Bestyrelsen har besluttet at anvende nogle af „Flora Agaricina Danica-Fondet"s Midler til delvis Rejseunderstøttelse for de udenlandske Mykologer.

Fra Undervisningsministeriet modtog Foreningen i Slutningen af forrige Finansaar (1952/53) 1000 Kr. til Trykning af „Friesia". Understøttelsen for 1953/54 var endnu ikke kommet til Udbetaling. Fra Sverige har vi modtaget 500 Kr. til Trykning af en Afhandling af Professor J. A. Nannfeldt og Dr. A. Pilát.

Medlemsantallet var glædeligvis steget med 36 Medlemmer og var pr. 31. December 1953: 587, idet der var gaaet 43 Medlemmer ud og var kommet 79 nye Medlemmer.

Følgende Medlemmer var døde siden sidste Generalforsamling: Lektor ved Viborg Kathedralskole J. P. Andersen (indmeldt 1932), Forstander Alfred Thøgersen, Statens Plantetilsyn, København (1929), Højesteretssagfører H. H. Bruun, København (1945) og fhv. Stationsforstander N. B. Buchwald, Langaa (1933).

Æret være Deres Minde!

2. Kassereren, Overlærer K. Bjørnekær aflagde derpaa Beretning: Regnskabet balancerede med 7306,71 Kr.; Kontingenter: 2294,00 Kr.; Renter: 49,28 Kr.; Salg: 728,73 Kr.; Kasse pr. 31.12.1953: 1485,00 Kr.; Sparekassebog: 1458,22 Kr.; Restancer: 746,00 Kr. Der var ingen Bogtrykkergæld pr. 31.12.1953. Paa „Flora Agaricina Danica-Fondet"s Sparekassebog henstod 7723,56 Kr. — Der blev givet Decharge for Regnskabet.

3. Bestyrelsesmedlemmerne Overlærer K. Bjørnekær, Direktør P. M. Wilkens, Professor Ø. Winge og Suppleanten Postmester J. P. Jensen, der afgik efter Tur, genvalgtes med Akklamation.

4. Revisoren, Ekspeditionssekretær K. Rankov genvalgtes med Akklamation.

5. Følgende Ekskursioner bragtes i Forslag: Om Foraaret til Ledreborg i Stedet for til Boserup Skov. Om Efteraaret: Boserup, Hallands Väderö, Röstånga, Borup-Skovene, Magleby Skov paa Stevns, Kongelunden og Jyderup-Skovene.

6. Eventuelt. Under dette Punkt gav Dirigenten, Hr. J. P. Jensen en Meddelelse om den topografisk-mykologiske Undersøgelse af Danmark.

(sign.) J. P. Jensen.

Efter Generalforsamlingen holdt først Amanuensis, cand. mag. E. Bille Hansen et Foredrag: „Sporespiring og Frugtlegemedannelse hos Storsvampe" med Demonstration af Svampekulturer. Et Referat af dette Foredrag vil fremkomme i „Naturhistorisk Tidende", 1955. Derpaa talte Professor D. Müller om Afskydning af Sporer hos *Sporobolomyces*. Foredraget, der er optaget i nærværende Hefte (S. 65), blev ledsaget af en Film optaget i Samarbejde med Fotograf, Lærer A. Øye og Amanuensis E. Bille Hansen.

Efter Foredraget var der som sædvanligt „tvangfrit Samvær" paa Universitetets Spisestuer.

E. Bille Hansen.

FORENINGEN TIL SVAMPEKUNDSKABENS FREMME

MEDLEMSFORTEGNELSE

DEN 31. DECEMBER 1954

Tallet i Parentes betegner det paagældende Medlems Løbenummer og Tallet længst til højre Aaret for Indmeldelsen i Foreningen.

a. Danmark

1. *København* (incl. *Frederiksberg* og *Gentofte)*

Abel, Astrid, Fru Direktør, Amalievej 2, V. (1115) 1944
Abildgaard, E., Ejendomsmægler, Estersvej 28 B, Hellerup (1565) 1951
Adolfsen, Eva, Sygeplejerske, Frk., Maltagade 34^4, S. (919) 1942
Andersen, Alfred, Kedelpasser, Beethovensvej 9^1 tv., SV. (1724) 1954
Andersen, Bitten, Fru, Ved Eltham 3, Hellerup (1497) 1950
Andersen, Elisabeth, Fru, Bomporten 8, Gentofte (1408) 1948
Andersen, Ellen, Fru Dommer, Lille Strandvej 10 A^3, Hellerup (706) ... 1941
Andersen, Gerdes, Viceskoleinspektør, Holmbladsgade 7^4, S. (1697) 1953
Andersen, Kjeld, Skotøjsarbejder, P. Sabroesgade 26^3, SV. (1719) 1954
Andreassen, Mary, Frk., Bispebjergvej 71^1, NV. (1522) 1951
Andresen, Holger, Husejer, Solsortvej 123, F. (943) 1942
Anthonsen, F., Fru, Provstevej 2 A^1, NV. (1741) 1954
Anton, Fru, Strandvej 14, Ø. (1717) 1954
Aust, S., Hr., Annettevej 20, Charlottenlund (1504) 1950
Bach, Erna, Amanuensis, cand. mag., Plantefysiologisk Laboratorium, Rolighedsvej 23, V. (1342) 1947
Backe, Ellen, Malerinde, Frk., Henrik Ibsensvej 11^1, V. (420) 1933
Baden, Jørgen, Inspektør, cand. agro., Rømersgade 7, K. (1457)..... 1949
Baltzersen, Ella, Frk., Ved Vigen 1^1, NV. (16) 1927
Bang, H. de, Orlogskaptajn, Gentoftegade 70^4, Gentofte (791) 1941
Bang, Harriet, cand. pharm., Frk., Upsalagade 5^5, Ø. (681) 1940
Barkhuus, W., Direktør, Prinsesse Maries Allé 3, V. (18) 1919
Barmer, Kaj, Hr., Kaalmarken 21, Søborg (1634) 1953
Barmer, Fru, Kaalmarken 21, Søborg (1635) 1953
Barrit, J., Assistent, Fru, Vinkelager 44^1, Vanløse (1525) 1951

Bartram, Erik, Læge, Runebergs Allé 2^1, Søborg (1251) 1945
Bauditz, Regitze, Frk., Havnegade 13 B. st. tv., K. (1744) 1954
Bekkevold, Lis, Fru, Ordrup Jagtvej 86, Charlottenlund (1644) 1953
Bengtsson, Gerda, Frk., N. J. Fjords Allé 9 st., V. (715) 1941
Berg, Svend, Maskinsnedker, Præstekærsvej 10 St. th., Brønshøj (997) 1943
Bing, Kaj, Direktør, Brodersens Allé 9, Hellerup (20) 1922
Bisgaard, E., Frk., Violvej 12, Gentofte (1395) 1948
Bjørnekær, K., Overlærer, Ved Klosteret 25^4, Ø. (21) 1927
Bjørnekær, Birgit, Frk., Ved Klosteret 25^4, Ø. (1140) 1945
Blide, Margrethe, Fru, Colbjørnsensgade 3^3, V. (1316) 1946
Blæsberg, Ida, Korrespondent, Frk., H. C. Lumbyesgade 14, Ø. (22) 1923
Bonnevie, Sv., Hr., Dyssegaard, Emmasvej 20, Gentofte (1444) 1949
Brink, Aage, Hr., Saxhøjvej 24, Valby (723) 1941
Brockenhuus von Løwenhielm, Edel, Frk., Skjoldsgade 11, Ø. (789) 1941
Brockmeyer, E., Civilingeniør, Kochsvej 6, V. (513) 1934
Brockmeyer, Sonja, Fru, Kochsvej 6, V. (1024) 1943
Broløs, Carl, Hr., Elmegade 2^4, N. (1602) 1952
Brøndum, Alfrede, Socialraadgiver, Frk., Nebbegaardsbakken 15, NV. (1684) 1953
Brøndum, Annie, Fru, Nebbegaardsbakken 15, NV. (1683) 1953
Buch, Orla, Assistent, Dronningensgade 57 St., K. (1503) 1950
Buchardt, O., Maskinmester, Jeppes Allé 5, NV. (1640) 1953
Buchardt, Kirstine, Fru, Jeppes Allé 5, NV. (1483) 1950
Buchwald, N. Fabritius, Professor, Peter Bangsvej 59^4, F. (25) 1925
Bukkehave, K., Frk., Haandværkerhaven 25^2, NV. (1739) 1954
Buus-Johansen, H., Landbrugskandidat, Peter Bangsvej 37^2, F. (1763) 1954
Bülow, E. von, Tandlæge, Ordrupvej 55 B^1, Charlottenlund (686) 1940
Carlsen, Hans, Viceskoleinspektør, cand. mag., Paludan Müllersvej 1^4, V. (1685) 1953
Christensen, Emmy Louise, Fru, Mariendalsvej 11^3, F. (1677) 1953
Christensen, Eva, Haandvæverske, Fru, Ryparken 84 St. tv., Ø. (929) ... 1942
Christensen, Helene, Fru, C. F. Richsvej 101 C^2, F. (1280) 1946
Christensen, Ingeborg, Frk., Rebekkavej 55^1, Hellerup (355) 1932
Christensen, Karen, Apoteker, Fru, Rymarksvej 18, Hellerup (65) 1918
Christensen, Karen Lilly, Bogholderske, Monrads Allé 3, Valby (822) 1941
Christensen, Valdemar, Sproglærer, Knabstrupvej 29, Brønshøj (811) 1941
Christiansen, Johanna, Fru, A. N. Hansens Allé 7, Hellerup (1732) 1954
Christiansen, M. P., Hr., Bjelkes Allé 39 St., N. (35) 1919
Clausen, Gerda, Fru, Strandvejen 123 St., Hellerup (1141) 1945
Clausen, Ingeborg, Fru, Vilvordevej 35, Charlottenlund (1673) 1953

Cordes, E., Assistent, Beethovensvej 8^3, V. (1238) 1945
Dahl, Ingeborg, Sygeplejerske, Fru, Krogebjerg 37, Vanløse (1681)..... 1953
Dam, R., Bankbestyrer, Toftekærsvej 121, Søborg (38) 1922
Danielsen, Inge, Fru, Bentzonsvej 51^1, F. (1474) 1950
Davidsen, B. C., Fru, Beringsvej 5, F. (1648) 1953
Degett, Inge, Fru, Holmbladsgade 32^1, S. (962) 1943
Dehn, E., Fuldmægtig, cand. polit., Ærenprisvej 29, Gentofte (39) 1917
Deleuran, E., Fru, Torupgaards Allé 32, Vanløse (524) 1935
Diersen, Anne-Lise, Fru, Eggersvej 10, Hellerup (1691) 1953
Drucker, Paul, Dr. med., Bredgade 51, K. (1714) 1954
Drucker, Fru, Bredgade 51, K. (1715) 1954
Dyre, Lily, Fru, Buskager 42, Vanløse (1733) 1954
Ejlers, Camille-Anne, Fru, Bomporten 34, Gentofte (1757) 1954
Eldahl, A., Reservelæge, Dr. med., H. C. Ørstedsvej 34^3, V. (652) 1940
Elmquist, V. Balslev, Hr., A. F. Beyersvej 15 A^3, F. (1491) 1950
Espholin, C., Fru Direktør, Hostrupshave 44^1, V. (1668) 1953
Falck, Kirsten, Fru, Strandboulevarden 13, Ø. (680) 1940
Falk, Ferdinand, Dr., Broholms Allé 12 C., Charlottenlund (710) 1941
Faurschou, Aage, Overretssagfører, Helleruplunds Allé 21, Hellerup (1123) 1944
Feddersen, Tage, Overlæge, Tranegaardsvej 67, Hellerup (50) 1915
Fiedler, I., Fru, Fuglegaardsvænget 76^1, Gentofte (1472) 1950
Flygenring, Vita, Frk., Borthigsgade 12, Ø. (1492) 1950
Frandsen, K. V., Hr., Borups Allé 18^1, N. (1445) 1949
Frandsen, E., Fru, Borups Allé 18^1, N. (1446) 1949
Friborg, Gunver, Fru, Aabakkevej 21, F. (1189) 1945
Fritsche, Rolf, Forretter, Saxogade 18^3, V. (1694) 1953
Fritsche, Fru, Saxogade 18^3, V. (1695) 1953
Fuchs, Sofie, Fru Direktør, Baunegaardsvej 44, Gentofte (1299) 1946
Fälling, E. M., Bogtrykker, Frederikssundsvej 166, Brønshøj (1569) 1951
Gabrielsen, E. K., Professor, Dr. phil., Rolighedsvej 23, V. (701) 1941
Gammelgaard, Ingeborg, Frk., Kildegaardsvej 12, Hellerup (530) 1935
Garfield, Assistent, Fru, Gothersgade 140^2, K. (872) 1942
Gauguin, Pierre-Sylvestre, Civilingeniør, Kathrinevej 12, Hellerup (1240) 1945
Gauguin, Germain Maria, Fru, Kathrinevej 12, Hellerup (1604) 1952
Glück, Lise, Fru, Vordingborggade 91, Ø. (1486) 1950
Goldschmidt, Fru Speditør, Amaliegade 41^2, K. (1354) 1947
Grønfeldt, Margrethe, Frk., Overgaden oven Vandet 82^4, K. (1731) 1954
Grøntved, Johs., Bibliotekar, mag. scient., Falkonerallé 31^4, F. (1146) 1945

Haakansson, T., Fru, Lille Strandvej 25, Hellerup (1662) 1953
Hallager, J., Frk., Sortedam Dosseringen 25^{2}, N. (80) 1908
Hannover, Knud, Direktør, Callisensvej 38, Hellerup (614) 1938
Hannover, Else, Fru, Callisensvej 38, Hellerup (615) 1938
Hansen, Alfred, Amanuensis, cand. mag., Elmelundevej 28 St., Brønshøj (1349) 1947
Hansen, Bertel, stud. mag., Carl Baggers Allé 21, Charlottenlund (1638) 1953
Hansen, C., Fru, Prîorsvej 8 St., F. (1758) 1954
Hansen, Erik Bille, Amanuensis, cand. mag., Rasmus Raskvej 6^{3}, Valby (651) 1940
Hansen, Henning P., Dr. agro., Rolighedsvej 23, V. (1712) 1954
Hansen, Inge, Kommunelærerinde, Frederiksberg Bredegade 7^{1}, F. (1482) 1950
Hansen, Jytte Søllinge, Frk., Østerbrogade 23^{2}, Ø. (1378) 1948
Hansen, Karen Sofie, Sygeplejerske, Frk., Maagevej 82^{4}, NV. (1523) 1951
Hansen, Karina Windfeld, Fru, Prinsesse Alexandrines Allé 8^{3}, Charlottenlund (763) 1941
Hansen, Lise, cand. mag., Frk., Kr. Zahrtmanns Plads 78^{2}, F. (1568) ... 1951
Hansen, Otto Bendix, Konfekturehandler, Maricvej 18, Hellerup (1563) 1951
Hansen, Sofus, Fru, Norgesgade 58^{4}, S. (1664) 1953
Hansen, Tove, Kommunelærerinde, Kapelvej 27^{2}, N. (1557) 1951
Harmsen, L., Laboratorieleder, cand. mag., Brødhøj 10, Gentofte (637) 1939
Hartmann, Ruth, Fru, Rømersgade 20 A, K. (1605) 1952
Hauerslev, K., Tandlæge, Axelborg ^{4} Sal, V. (1560) 1951
Hellmers, E., Amanuensis, mag. agro., Nymindevej 9, Vanløse (699) ... 1940
Hendriksen, C. V., Arkitekt, Tønnesvej 12, S. (1082) 1944
Henriksen, A. P., Hr., Dalen 25, Søborg (1385) 1948
Henriksen, Astrid, Fru, Frederiksberg Allé 76^{5}, V. (1730) 1954
Henriksen, K., Heliogravør, Stormgade 12, K. (96) 1908
Henriksen, Marie, Fru, Dalen 25, Søborg (1536) 1951
Henriksen, Niels, Assistent, Dalen 25, Søborg (1535) 1951
Henriques, N. H., Reklamechef, Carl Plougsvej 8, V. (843) 1942
Hermansen, H. A., Overassistent, Købmagergades Postkontor, K. (768) 1941
Hertz, Aksel, Ingeniør, Henrik Hertzvej 13, Charlottenlund (613) 1938
Hertz, E., Fru, Bogtrykker, Bogtrykkergaarden, Snorresgade, S. (327) 1931
Hertz, Irma, Fru, Lundsgade 4, Ø. (573) 1936
Hertz, V., Øjenlæge, Dr. med., Skjoldsgade 11, Ø. (101) 1917
Hestehave, Ellen, Frk., Jagtvej 29 C^{4} tv., N. (1225) 1927
Heyman, P. M., Revisor, Vesterbrogade 152, V. (696) 1940
Heyman, Ebba, Fru, Vesterbrogade 152, V. (697) 1940

Hindhede, J., Ingeniør, Parkovsvej 65, Gentofte (1749) 1954
Hindhede, Fru, Parkovsvej 65, Gentofte (1750) 1954
Hofgaard, Conrad, Ambassaderaad, Norges Ambassade, Amaliegade 12, K. (1658) 1953
Holck-Larsen, Karen, Fru, Solsortvej 70, F. (1693) 1953
Holm, Eli, Klinikchef, Værnedamsvej 20, V. (1721) 1954
Holm, Svend, Sølvsmed, Ndr. Frihavnsgade 67[1], Ø. (734) 1941
Holstein, Bodil, Assistent, Frk., Vigerslevvej 330[2], Valby (1725) 1954
Holten, Ellis, Frk., Østervoldgade 14[1], K. (694) 1940
Holten, J., Ingeniør, Kronprinsessegade 38, K. (456) 1934
Holten, M., Fru, Østervoldgade 14[1], K. (370) 1932
Holton, E., Laborant, Sorrentovej 15[2], S. (1239) 1945
Horten, K. R., Fuldmægtig, cand. jur., Egehøjvej 3, Charlottenlund (1479) 1950
Horten, Frida, cand. jur., Fru, Egehøjvej 3, Charlottenlund (1480) 1950
Højgaard, Erling, Kunstmaler, Kildebakkegaardsallé 209, Buddinge pr. Søborg (640) 1939
Ipsen, Poula, Fru, Dybendalsvej 56[1], F. (1671) 1953
Ivarsson, Sixten, Repræsentant, Ryesgade 103 C[1], Ø. (928) 1942
Iversen, P., Prokurist, Sortedam Dosseringen 25, St., N. (555) 1935
Iversen, Karen, Frk., Sortedam Dosseringen 25, N. (586) 1936
Jacobsen, Karen, Frk., Nansensgade 62, K. (923) 1942
Jensen, A. Tovborg, Professor, Dr. phil., Kemisk Laboratorium, Bülowsvej 13, V. (1389) 1948
Jensen, H. F., Hr., Buddinge Hovedgade 281, Søborg (1473) 1950
Jensen, Harriet, Frk., Nyvej 8 A[5], V. (1745) 1954
Jensen, Hoffmann, Bager, Ravnekærsvej 21, Søborg (1038) 1943
Jensen, J. P., fhv. Postmester, Grenaagade 3, Ø. (540) 1935
Jensen, Nærvig, Fru, Fjenneslevvej 20 A[2], Brønshøj (1594) 1952
Jensen, Poul E., Kolonialhandler, Ndr. Frihavnsgade 50, Ø. (667) 1940
Jensen, Rud, Frk., Hyldegaardsvej 48 St., Charlottenlund (1470) 1950
Jeppesen, Viktor, Ingeniør, Gladsaxevej 38—44, Søborg (1676) 1953
Jessen, Grete, Frk., Forhaabningsholmsallé 27[4], V. (1387) 1948
Jessen, Knud, Professor, Dr. phil., Botanisk Laboratorium, Gothersgade 140, K. (911) 1942
Jordahn, Edith, Fru, Malmøgade 11, Ø. (1052) 1944
Jørgensen, Carl, Dr. med., Postbox 163, K. (122) 1918
Jørgensen, E., Købmand, Vangedevej 1, Gentofte (1652) 1953
Jørgensen, Erik, Amanuensis, Forstkandidat, Musvaagevej 7[3], NV. (1441) 1949

Jørgensen, Grete, Fru, Musvaagevej 7^3, NV. (1461) 1950
Jørgensen, Henrik Alb., Assistent, Mag. agro., Søndermarksvej 10, Valby (1426) 1949
Jørgensen, Karen, Frk., Rodosvej 27, S. (1596) 1952
Jørgensen, Ruth, Fru, Nedertoften 9^3, Vanløse (1622) 1952
Jørgensen, Ulla, Frk., Hatteforretningen „Prikken", Amagerbrogade 3, S. (1075) 1944
Jørgensen, Walther, Grosserer, Tustrupvej 5, Vanløse (1688) 1953
Kemp, O. V., Tandlæge, Amagertorv 11, K. (1572) 1951
Kjersmeier, A., cand. jur., Fru, Svendsgade 1^4, V. (657) 1940
Kjær, Augusta, Fru, Næsbyholmvej 14 B, Brønshøj (1550) 1951
Kjær, Betsy, Amanuensis, cand. polyt., Fru, Agrikulturkemisk Laboratorium, Bülowsvej 13, V. (1390) 1948
Kjærgaard, Dorthe, Pensionatsværtinde, Frk., H. C. Ørstedsvej 25, V. (885) 1942
Klusmann, V., Tandtekniker, Søndre Fasanvej 45^4, F. (1368) 1948
Korup, Eyvind, Disponent, Dronningens Tværgade 23, K. (905) 1942
Korup, Annelise, Fru, Dronningens Tværgade 23, K. (906) 1942
Kragh, Ebba, Fru, Godthaabsvænget 8, F. (1229) 1945
Krogsgaard, Gerda, Kontorassistent, Frk., Stilledal 41, Vanløse (1022) 1943
Krumbach, Soffy, Fru, Maglemosevej 13, Hellerup (1675) 1953
Krøger, Olga, Fru Bankdirektør, Vester Voldgade 131, V. (139) 1927
Kudahl, I., Fru, Egholmvej 45, Vanløse (648) 1939
Lange, Agnete, Frk., Kirkevænget 4, Valby (853) 1942
Lange, Peter, Montør, Glinkasvej 12^2, SV. (1761) 1954
Lange, Ditte, Kontorassistent Fru, Glinkasvej 12^2, SV. (1762) 1954
Larsen, Charlie, Overassistent, Lersø Parkallé 171, Ø. (1609) 1952
Larsen, Edmund, Hr., Bjergstedvej 8, Brønshøj (1606) 1952
Larsen, Hans, Hr., P. Knudsensgade 112 St., SV. (1666) 1953
Larsen, Ingrid, Kontormedhjælper, Fru, Lersø Parkallé 171, Ø. (1610)... 1952
Larsen, Svend, Overassistent, Nørre Allé 41, N. (1074) 1944
Larsen, Sylvest, Inspektør, Sortedam Dosseringen 13 B., N. (1566) ... 1951
Larsson, Poul, Tegner, Holger Danskesvej 77^1, F. (1223) 1945
Lassen, K. C., Ingeniør, Kaas Allé 27, Hellerup (1276) 1946
Laumer, M., Oversætter, Rosenørnsallé 42^3, V. (1649) 1953
Leffers, J., Frk., Classensgade 61^4, Ø. (1432) 1949
Lemtorp, Bodil, Fru, Vanløse Allé 26 St., F. (1670) 1953
Liisberg, A., Frk., Guldbergsgade 103^2, N. (1727) 1954
Lindhard, Katja, Fru Brandinspektør, Frederikssundsvej 83, NV. (1285) 1946
Lokvig, Gaston, Hr., Nøkkerosevej 31, NV. (1621) 1952

Lokvig, Tove, Fru, Nøkkerosevej 31, NV. (1615) 1952
Lorck, H. B., Assistent, mag. agro., Taasingegade 36², Ø. (1440) 1949
Lose, Poul, Reklametegner, Byhøjen 26¹, Vanløse (1324) 1946
Lose, Fru, Byhøjen 26¹, Vanløse (1333) 1946
Lund, Aage, Dr. phil., V. E. Gamborgsvej 10⁴, F. (157) 1929
Lundsbøll, E., Skotøjshandler, Holbergsgade 24, K. (1592) 1952
Lundsbøll, Vera, Fru, Holbergsgade 24, K. (1593) 1952
Lundsgaard, A., Fru, Grundtvigsvej 14 B², V. (1759) 1954
Luzi, R., Generalkonsul, Mindevej 43, Søborg (162) 1925
Læk, Knud, Lagerchef, Aalandsgade 25, S. (1650) 1953
Læk, Ethel, Fru, Aalandsgade 25, S. (1651) 1953
Løhr, Erika, mag. scient., Fru, Plantefysiologisk Lab., Gothersgade 140, K. (1537) 1951
Maag, P., Ingeniør, St. Kongensgade 25, K. (1035) 1943
Maaløe, Johanne, Fru, Østerbrogade 158, Ø. (892) 1942
Madsen, Børge, K., Gartner, Aarhusgade 89², Ø. (809) 1941
Madsen, Karen, Fru, Backersvej 45¹, S. (1661) 1953
Madsen, S. B., Inspektør, mag. agro., Nørregaardsvej 38, Vanløse (584) 1936
Madsen, Valborg, Frk., Hesseløgade 22², Ø. (165) 1924
Madsen, Edith, Frk., Hesseløgade 22², Ø. (1281) 1946
Markussen, Otto, Boghandler, Gl. Kongevej 132, V. (1515) 1951
Mathiasen, A., Frk., Hesseløgade 3³, Ø. (170) 1922
Mathiasen, Karen, Frk., Fensmarksgade 3, N. (957) 1943
Melloni, D. K., Fru, Haandværkerhaven 2, NV. (1679) 1953
Meyland-Smith, E., Forstanderinde, Frk., Hostrups Have 48¹, V. (485) 1934
Moesmann, I. P., Læge, Haderslevgade 27³, V. (547) 1935
Moesmann, Gabriele, Fru, Haderslevgade 27³, V. (1520) 1951
Moltved, Margrethe, Fru, Nordborggade 5, Ø. (1743) 1954
Mortensen, R. E., Telegrafassistent, Frk., Murergade 9 B⁴, N. (1151) ... 1945
Mundt, K., Retspræsident, Halls Allé 10, V. (181) 1905
Munkvad, R., Frk., Lystrupvej 14, Brønshøj (375) 1932
Müller, D., Professor, Dr. phil., Gothersgade 140, K. (412) 1932
Møller, Lissy Espegreen, Stud. mag., G. A. Hagemanns Kollegium, Kristianiagade 10, Ø. (1700) 1953
Nebelong, Ellen, Fru, Victor Bendixgade 11, Ø. (1678) 1953
Neergaard, Paul, Dr. agro., Gothersgade 158⁵, K. (373) 1932
Neuhaus, Tove, Overtoldassistent, Frk., Holsteinsgade 5⁴, Ø. (1642) ... 1953
Nielsen, Caroline, Viceskoleinspektrice, Frk., Vespervej 44¹, Hellerup (618) 1938
Nielsen, Ebba Bernth, Sygeplejerske, Fru, Turesensgade 23², K. (1577) 1951

Nielsen, Grete, Fru, Finsensvej 39 C[4], F. (1555) 1951
Nielsen, Hans-Jørgen, Læge, Ryparken 84 St. tv., Ø. (1551) 1951
Nielsen, Svend, Arkitekt, Gl. Kongevej 136[4], V. (878) 1942
Nielsen, Th., Hr., Havdrupvej 5[2] tv., Brønshøj (1439) 1949
Nielsen, Th., Fru, Havdrupvej 5[2] tv., Brønshøj (1616) 1952
Nielsen, V. A., Fru, Stefansgade 58[3], N. (1045) 1944
Nielsen, Vivi, Kommunelærerinde, Kastrupvej 177[2], S. (1735) 1954
Nilou, Henning, Civilingeniør, Kirstinedalsvej 16, Valby (819) 1941
Ohlson, Else, Frk., Viborggade 36, Ø. (1672) 1953
Olesen, Inge, Kontormedhjælper, Frk., Abildgaardsgade 24[2], Ø. (1612) 1952
Olsen, Fritz, Skomagermester, Lindegaardsvej 2, Charlottenlund (665) 1940
Ottosen, Gaston, Kontorassistent, Roskildevej 282 E[2], Valby (1713) ... 1954
Pedersen, Harald, Ekspeditionssekretær, Norasvej 13[1], Charlottenlund (1706) 1953
Pedersen, P. C., M. D. H. R., Hr., Strandvej 229 C[1], Charlottenlund (1698) 1953
Petersen, Asta, Fru, Hollændervej 4[1], V. (1471) 1950
Petersen, Ebba Gjeding, Fru, Markmandsgade 5[5], S. (1597) 1952
Petersen, Gunnar, Tandlæge, Havnegade 13, K. (1614) 1952
Petersen, Herluf, Adjunkt, cand. mag., Wergelands Allé 37, Søborg (884) 1942
Petersen, Lisse Piletræ, Fru, Landerslevvej 6, Søborg (1527) 1951
Poulsen, Else Nyholm, Fru, Gentoftegade 33, Gentofte (1393) 1948
Poulsen, Else Refslund, Skolesundhedsplejerske, Frk., Blidahpark 25[1] tv., Hellerup (1197) 1945
Poulsen, Th., Fru, Egilsgade 60, S. (1152) 1945
Probst, Jan Henrik, Læge, Landlystvej 77, Valby (1726) 1954
Rankov, K. A., Ekspeditionssekretær, Torvegade 27[4], K. (215) 1925
Rasmussen, Anne Flor, Fru, Norsvej 6[1], V. (1562) 1951
Rasmussen, C. H., Maskinmester, Vognmandsmarken 42[1], Ø. (1241) ... 1945
Rasmussen, Henning, Landsretssagfører, Vester Voldgade 10, V. (1488) 1950
Rasmussen, Gerda, Fru Landsretssagfører, Vester Voldgade 10, V. (1489) 1950
Rasmussen, J. K., Ingeniør, Norsvej 6[1], V. (1570) 1951
Rasmussen, K., Overingeniør, cand. polyt., Søholm Park 5, Hellerup (475) 1934
Rasmussen, Kirsten, Fru, Ved Andebakken 6[1], F. (1468) 1950
Rasmussen, Willy, Cand. pharm., Strandboulevarden 111[4], Ø. (1300) ... 1946
Refer, Else, Fru, Limfjordsvej 40. F. (1192) 1945
Riis, H. C., pens. Godsexpeditør, Frederik d. 6.s Allé 10[4], F. (1257) 1945
Rosenlund, Olav, Civilingeniør, Vognborgvej 1, F. (1682) 1953

Ryssel, C., Overassistent, Fru, Kastrupvej 80, S. (1740) 1954
Rønne, Børge, Redaktør, Maglegaards Allé 19, Søborg (1548) 1951
Rønne, Fru, Maglegaards Allé 19, Søborg (1549) 1951
Rønne, Gerhard, Fru, Læge, Øster Søgade 106, Ø. (1641) 1953
Saabye, Ulla, Frk., Strandvej 167[4] th., Hellerup (1620) 1952
Samuelsen, H. P., Overgartner, Frederiksberg Runddel 1, F. (838) 1941
Samuelsen, Jean, Fru, Frederiksberg Runddel 1, F. (1319) 1946
Schade, Guri, Fru, Kildevældsgade 69, Ø. (1048) 1944
Scheel, Rud., Fuldmægtig, Hjørringgade 29, Ø. (1607) 1952
Scheel, Magda, Fru, Hjørringgade 29, Ø. (1608) 1952
Schierbeck, Else, Fru, Kastelsvej 16, Ø. (1699) 1953
Schmidt, Gudrun, Fru, Morsøvej 8 St., Ø. (1210) 1945
Schrøder, Aage, fhv. Postmester, Kildegaardsvænget 38, Hellerup (1752) 1954
Schrøder, Magda, Fru, Kildegaardsvænget 38, Hellerup (1753) 1954
Schrøder, Ebba, Frk., Fuglegaardsvej 37, Gentofte (1098) 1944
Schrøder, Ove, Maskinmester, Klarasvej 8 B., Ordrup pr. Charlottenlund (1361) 1947
Schrøder, Elna, Fru, Klarasvej 8 B., Ordrup pr. Charlottenlund (1362) 1947
Schultz, J. E., Tandlæge, Vesterbrogade 143, V. (1134) 1945
Simonsohn, Hr., Frimestervej 75[3], NV. (1655) 1953
Simonsohn, Gerda, Fru, Frimestervej 75[3], NV. (1656) 1953
Sindballe, R., Fru, Vestersøgade 70, V. (1574) 1951
Skadhauge, Karla, Assistent Frk., Nørre Voldgade 102[2], K. (1377) 1948
Skov, Kai, Hr., Bispeparken 36, NV. (1579) 1951
Slot, Ingrid, Husholdningslærerinde, Frk., Vigerslev Allé 82, Valby (993) 1943
Snertinge, L. J., Fru, Dannebrogsgade 11, V. (1722) 1954
Sommer, Bente, Frk., Dosseringen 4, N. (1487) 1950
Sonne, Ane, Fru, Ved Klosteret 5[3], Ø. (796) 1941
Stahlfest-Møller, Fru Fabrikant, Koldinggade 3, Ø. (836) 1941
Steensen, Erik, Fuldmægtig, cand. jur., Hyldegaardsvej 30, Charlottenlund (1702) 1953
Steensen, Ellen, Fru, Hyldegaardsvej 30, Charlottenlund (1703) 1953
Stich, Egon, Kommunelærer, Vanløse Byvej 24[1], Vanløse (1143) 1945
Stich, Inger, Fru, Vanløse Byvej 24[1], Vanløse (1145) 1945
Sundsvold, Erling, Cand. pharm., Gudenaavej 13, F. (1060) 1944
Sveistrup, P., Elektroingeniør, Kildegaardsvej 95, Hellerup (1624) 1952
Svensson, Selma, Frk., c/o. Hr. Sagfører E. Deleuran, Gothersgade 135, K. (1646) 1953
Sørensen, Ejnar, Husejer, Vestersøgade 78, V. (1501) 1950
Sørensen, Yrsa, Frk., Kochsvej 13, V. (1667) 1953

Tanggaard, Tone, Frk., Nikolaj Plads 7, K. (1047) 1944
Tegner, B., Civilingeniør, H. C. Ørstedsvej 22 A., V. (249) 1925
Terney, Ellen, Fru, Mariendalsvej 56[4], F. (1659) 1953
Tessum, Grete, Fru, Kaprifolievej 21, S. (1603) 1952
Theilbøl, A., Forretningsdrivende, Frk., Vespervej 44, Hellerup (823) ... 1941
Them, E. D., Boghandler, Ordrupvej 62 A., Charlottenlund (797) 1941
Them, Fru Boghandler, Ordrupvej 62 A., Charlottenlund (810) 1941
Them, E. M. P., Civilingeniør, Rothesgade 8, Ø. (1545) 1951
Them, Fru, Rothesgade 8, Ø. (1546) 1951
Thingvad, Lily, Fru, Holsteinsgade 6, Ø. (1586) 1952
Thomsen, P., Fru, „Aromatic", Vesterbrogade 3, V. (887) 1942
Thornholm, Elin, Fru, Havebo 15, Valby (1660) 1953
Thygesen, Per, Kommunelæge, Vesterbrogade 66, V. (465) 1934
Thyssen, E., Fru, Aabenraa 12, K. (1293) 1946
Thyssen, K. P., Manufakturhandler, Aabenraa 12, K. (1343) 1947
Tofte, A., Kriminaloverbetjent, Madvigs Allé 16[2], V. (1589) 1952
Tofte, Erna, Fru, Madvigs Allé 16[2], V. (340) 1931
Torup, Else, Læge, Frk., Ved Bellahøjvej 11, Brønshøj (1647) 1953
Troyer, Sv., Fabrikant, Badstuestræde 10[2], K. (1178) 1945
Troyer, Kirstine, Fru, Badstuestræde 10[2], K. (1177) 1945
Truelsen, G., Mekaniker, Ryparken 152, Ø. (1567) 1951
Ulrich, Aase, Sygeplejerske, Frk., Annettevej 20, Charlottenlund (802) 1941
Valbjørn, Kurt, Købmand, Øster Farimagsgade 24, Ø. (1623) 1952
Valentin, Adelheid, Tegner, Frk., Orla Lehmannsvej 2[1], F. (748) 1941
Vedel, A. H., Viceadmiral, Rypevej 13, Hellerup (626) 1938
Vedel, Kirsten, Fru, Rypevej 13, Hellerup (627) 1938
Vedel, Birgitte, Fru, Jægersborg Allé 51, Charlottenlund (1707) 1953
Vikelsøe, Inger, Fru, Tersløsevej 15[1], Brønshøj (772) 1941
Vindum, Astrid, Fru, Halmtorvet 22[5], V. (1511) 1950
Waetzold, E., Fru, Ved Grænsen 28, F. (601) 1937
Weilstrup, Margr., Fru, Colbjørnsensgade 12[1], V. (1155) 1945
Wennerwald, Edith, Fru, Silkeborggade 6 St., Ø. (1674) 1953
Wersner, Poul, Hr., Vesterfælledvej 76[3] tv., V. (1619) 1952
Wildt, Gerda, Frk., Sigbrits Allé 4, S. (1723) 1954
Wilkens, P. M., Direktør, Kilholmvej 21, Vanløse (277) 1925
Wilkens, M., Fru, Kilholmvej 21, Vanløse (278) 1929
Winding, Aage, Ekviperingshandler, Øster Farimagsgade 75[4], Ø. (278) 1925
Winge, Ø., Professor, Dr. phil., Gl. Carlsbergvej 10, Valby (283) 1905
Winge, J., Fru, Gl. Carlsbergvej 10, Valby (284) 1913
Witter, Steffi, Fru, Fjords Allé 13[3], V. (1754) 1954

Wulff, Gurli Bülow, Frk., Dr. Tværgade 35^4, K. (1690) 1953
Wulff, L., Fru, Slotsherrensvej 151, Vanløse (1657) 1953
Wærum, G., Grosserer, Frederiksborggade 1 B., K. (1350) 1947
Yde-Sørensen, V., Hr., Mjøsensgade 11^4 th., S. (1617) 1952
Yde-Sørensen, Helga, Fru, Mjøsensgade 11^4 th., S. (1618) 1952

Plantepatologisk Afdeling, Den kgl. Veterinær- og Landbohøjskole, Rolighedsvej 23, V. (346) 1932
Tørsleffs Husmoder Service, Kronprinsessegade 36, K. (1113) 1944

2. *Københavns Omegn*

Andersen, E. Anker, Fru, Høje Sandbjergvej, Holte (1556) 1951
Arboe, Jytte, Fru, Søbakken 15, Klampenborg (1454) 1949
Boesen, Gerda, Fru Baneingeniør, Frederikslundsvej 37, Holte (868) ... 1942
Bostrøm, Gunnar, Civilingeniør, Glaciset 32, Lyngby (1494) 1950
Bruhns, Kaj, Afdelingschef, Virumbakken 15, Virum pr. Lyngby (1119) 1944
Bøgh, Erik, Fritidshjemsleder, Hareskovvej 1, Værløse (1737) 1954
Christensen, Knud Ove, Grosserer, Forpagterboligen, Frederiksdal Slot pr. Lyngby (1508) 1950
Christensen, Helle, Fru, Forpagterboligen, Frederiksdal Slot pr. Lyngby (1509) 1950
Clausen, Kay, Civilingeniør, Hasselvej 47, Virum (1032) 1943
Clausen, Gerda, Fru Civilingeniør, Hasselvej 47, Virum (1033) 1943
Dalby, Axel, Hr., Kastrupkrogen 12^2 tv., Kastrup (1746) 1954
Eldrup-Jørgensen, Erik, Civilingeniør, Sirgræsvej 21^2, Kastrup (1742) 1954
Elleby, K., Sognepræst, cand. theol., Kildevej 12^2, Glostrup (644) 1939
Fischer, Agnes, Frk., Amager Landevej 5, Kastrup (1101) 1944
Fode, Chr., Grosserer, Klampenborgvej 31, Klampenborg (1156) 1945
Fode, Else-Marie, Fru, Klampenborgvej 31, Klampenborg (1157) 1945
Frederiksen, Erling, Direktør, mag. scient., Kongevejen 141, Holte (1254) 1945
Frydenberg, I., Fru, Taarbæksdalsvej 3 A St., Klampenborg (851) 1942
Glahn, Cathrine Kerr, Fru, Ulrikkenborg Allé 35, Lyngby (1528) 1951
Gram, Ernst, Forstander, cand. mag., Hummeltoftevej 2, Lyngby (72) 1912
Gramkow, Ida, Assistent, Frk., Gillesager 82^2, Brøndbyøster pr. Glostrup (1023) 1943
Gundlach, E. K., Maskinmester, Solvænget 7, Lyngby (1036) 1943
Hansen, Ida, Frk., Birkevang 5, Virum pr. Lyngby (1534) 1951
Hansen, Mogens, Civilingeniør, Østermarievej 26, Kastrup (1270) 1945

Hertz, Steffen, Ingeniør, Skottegaarden 12⁵, Kastrup (100) 1928
Holstebroe, Helga, Fru Ingeniør, Krogvej 8, Holte (760) 1941
Jelnæs, Else, Fru Skovtaksator, Øverødvej 43, Holte (1329) 1946
Johansen, Gurli, Fru, Engvej 34, Vedbæk (1629) 1952
Jürgensen, W. S., Civilingeniør, Nørgaardsvej 18 D, Lyngby (1686) ... 1953
Jürgensen, Fru, Nørgaardsvej 18 D, Lyngby (1687) 1953
Jønsson, E., Frk., Paradisvænget 16, Holte (1587) 1952
Klitlund, Aage, Hr., Bagsværdvej 24 C, Lyngby (1539) 1951
Krause-Thomsen, I. W., Ingeniør, Kaplevej 34, Lyngby (1696) 1953
Lange, Morten, Universitetsadjunkt, Dr. phil., Rønnebærvej 66, Holte (650) 1939
Larsen, Jan Fhær, Civilingeniør, Lyngbygaardsvej 19 B, Lyngby (1321) 1946
Lauritsen, Poul, Kontorchef, Rustenborgvej 4 B, Lyngby (151) 1927
Laustsen, M., Fru, Hegnsvej 32, Nærum (1388) 1948
Lund, Else, Fru Bankbestyrer, Køgevej 10, Taastrup (1514) 1951
Merlev, Knud, Hr., Askimvej 27, Virum pr. Holte (1530) 1951
Moesgaard, L., Fængselsbetjent, Syvstjernen pr. Lille Værløse (1747) 1954
Mundt, Jørgen, Cand. jur., Kornbakken 13, Lyngby (558) 1936
Nielsen, H. Schwarz, Hr., Strandvej 157 A., Skodsborg (1716) 1954
Nielsen, Inga, Fru, Parcelvej 32 A., Holte (1748) 1954
Nielsen, Otto Hamborg, Radiotelegrafist, Frederiksdalsvej 105 E¹, Virum (1663) 1953
Olsen, Erik, Snedker, Gerdasvej 35, Glostrup (1689) 1953
Paulsen, J. Hagensen, Cand. pharm., Uglemosen 2, Virum (1478) 1950
Pedersen, Vita, Fru, Rønnebærvej 61, Holte (1414) 1948
Schau, Else Marie, Laboratoriechef, Frk., Erdalsvej 37, Glostrup (1760) 1954
Schrøder, M., Husholdningslærerinde, Fru, Ulrikkenborg Allé 46¹, Lyngby (1004) 1943
Stapel, Chr., Afdelingsbestyrer, Statens plantepatologiske Forsøg, Lyngby (300) 1930
Søe-Pedersen, Agnete, Frk., Hummeltoftevej 42, Lyngby (859) 1942
Sørensen, Hjarne, Ingeniør, Haraldslundvej 28, Lyngby (1611) 1952
Sørensen, Karen, Fru Trafikkontrollør, Glaciset 35, Lyngby (1328) 1946
Thomasen, Holger B., Civilingeniør, Grønnevej 262, Virum (1734) 1954
Trane, E. A. Selmer, Fru, Holmelins Tværvej 12, Lyngby (1704) 1953
Treschow, C., Direktør, Dr. agro., Lollikgaard, Holte (471) 1934
Tønnesen, Hedvig, Fru Civilingeniør, Syrefabriksvej 30, Kastrup (1692) 1953
Voss, Aage, Translatør, Dyrehavevej 12, Klampenborg (1533) 1951
Weile, Jens, Lærer, Rosenvænget 19, Lyngby (452) 1934

3. *Øvrige Sjælland*

Andersen, A. L. C., Gartner, Roskildevej 17 C, Holbæk (1463) 1950
Andersen, Knud, Cand. mag., Bistruplund 5^2, Birkerød (1291) 1946
Aust, W., Hr., Knabstrup (1599) 1952
Boeck, Bianco, Amtsfuldmægtig, cand. jur., Holmegaardsvej 33, Hillerød (1654) 1953
Bregnhøj Larsen, J. E., Tandlæge, Allerød (806) 1941
Bremerstent, E., Overbibliotekar, Helsingør (1282) 1946
Bülow, Kjeld, Læge, Klokkestøbergade 29^1, Slagelse (660) 1940
Bøggild, Albert, Læge, Skelskør (1275) 1945
Christensen, A. P., Værkfører, Ugerløse pr. Ugerløse (1718) 1954
Christensen, Ellen, Seminarieelev, Vordingborg Seminarium, Vordingborg (1708) 1953
Christophersen, Ruth, Tandlæge, Frk., Kongensgade 26, Slangerup (1095) 1944
Dam, Folmer, Forstander, „Ankerhus", Sorø (995) 1943
Dijnes, Torben, Seminarielærer, cand. theol., Violvej 4, Vordingborg (1601) 1952
Dyrnæs, P., Hr., Allerød (1755) 1954
Erup, Otto, Cand. pharm., De danske Spritfabrikker, Slagelse (711) ... 1941
Ferdinand, Johs., Lektor, Broskov, Tappernøje (51) 1918
Flensborg, Bent, Boghandler, Lærkevej 9, Roskilde (1552) 1951
Flensborg, Else, Fru, Lærkevej 9, Roskilde (1564) 1951
Glode, Vibeke G., Fru, Maagevej 14, Fredensborg (1129) 1945
Grøntved, P., Konsulent, Sydsjællands Planteavlsudvalg, Næstved (611) 1938
Hansen, Sigv., Lektor, Lindholmsgade 8, Næstved (1365) 1947
Jensen, K., Lærer, Vestergade 8, Helsinge (1453) 1949
Johannesen, Birgit, Seminarieelev, Vordingborg Seminarium, Vordingborg (1709) 1953
Karnov, M., Overretssagfører, Olaf Poulsens Allé 4, Fredensborg (1356) 1947
Klavdel, Ilse, Fru, Smaabørnspædagog, Hareskovvej 1, Værløse (1736) 1954
Krog, M, S., Apoteker, Stubbedamsvej 5, Helsingør (137) 1921
Larsen, G., Lærer, Enghavevej 14, Hillerød (440) 1933
Madsen, Arnold, Læge, Strandgade 39, Helsingør (164) 1921
Møller, Preben, Fabriksarbejder, Vindingevej 61 A. St. th., Roskilde (945) 1942
Petersen, Ella, Frk., Taastrup Nr. 30, Holbæk (844) 1942
Petersen, Haagen, Inspektør, Bjergegade 28 B., Helsingør (813) 1941
Pilgaard, A., Hr., Nygade 22, Helsinge (1443) 1949
Rasmussen, C. O., Tandlæge, Ndr. Strandvej 372, Hornbæk (746) 1941

Schmidt, Erik, Hr., Bindeledet 25, Bagsværd (1653) 1953
Severin, Gunnar, Ingeniør, Tværleddet 50, Bagsværd (1252) 1945
Severin, Margrethe, Fru, Tværleddet 50, Bagsværd (1253) 1945
Solholm, Anne, Kontorassistent, Frk., Pilegaardsvej 51, Herlev (1756) 1954
Solholm, Karen, Fru, Pilegaardsvej 51, Herlev (1751) 1954
Strandgaard, K., Cand. jur., Nordlyvej 3, Taarbæk (1680) 1953
Sveegaard, H., Boghandler, Helsinge (531) 1935
Sørensen, E. Just, Lærer, Birkevej 6 St. th., Frederiksværk (1367) 1947
Toft, Karin, Fru Læge, Byvolden 25, Roskilde (918) 1942
Udsholt, Oline, Lærerinde, Fru, Starreklinte Skole pr. Starreklinte (873) 1942

Helsingør Centralbibliotek, Helsingør (1590) 1952
Nordvestsjællands naturhistoriske Forening, v. Skovrider Vilh. Kjølby, Bjergsted pr. Svebølle (1578) 1951

4. *Falster*

Dreyer, Rasmus, Journalist, Jernbanegade 42, Nykøbing F. (1375) 1948
Døssing, L., Bibliotekar, Christiansmindevej 1, Nykøbing F. (1626) ... 1952
Hansen, Agnes, Overlærer Fru, Thorsensvej 48, Nykøbing F. (85) 1929
Møller, F. H., Overlærer, Vesterskovvej 66, Nykøbing F. (90) 1912

Centralbiblioteket for Maribo Amt, Classenske Bogsamling, Nykøbing F. (439) 1934

5. *Lolland*

Christensen, Vilhelmine, Frk., Rosenparken 12 E, Nakskov (34) 1924
Mortensen, Herve, Lærer, Sakskøbing (1710) 1953
Nielsen, N. Juul, Kontorchef, Rødbyvej 60, Nakskov (702) 1941
Westergaard, C. H., Boghandler, Nygade 2, Nakskov (1124) 1944

Naturhistorisk Forening for Lolland-Falster, Kildegaardsvej 3, Sundby, Loll. (Farmaceut Erik Pyndt) (450) 1934

6. *Fyn med Øer*

Larsen, Asger, Mag. agro., Aarslev Forsøgsstation, Fyn (583) 1936
Lauritsen, L. P., Sparekassebogholder, Tranderup, Ærøskøbing, Ærø (368) 1932
Pedersen, Vald., Lærer, Egense Skole pr. Egense (1171) 1945
Qvistgaard, P., Skovrider, Liljedal pr. Ejby, Fyn (764) 1941

7. *Nørrejylland med Øer*

Buchwald, Astrid, Fru Stationsforstander, „Jægerhytten", Langaa (451) 1933
Christensen, Knud, Overlærer, Finsensgade 63[1], Aarhus (638) 1939
Christensen, Richard, Hr., Smede- og Maskinforretning, Brørup (1738) 1954
Degett, J. A., Overtoldassistent, Bjergegade 56, Fredericia (805) 1941
Hauerbach, Alfred, Grosserer, Solgaarden, Hobrovej, Randers (1127) 1944
Jacobsen, Børge, Forædlingsleder, mag. agro., Forædlingsstationen, Vandel (666) 1940
Klinge, Axel, B., Grosserer, Aage Beksvej, Hornbæk pr. Randers (804) 1941
Lamberg, Kristian, Kommunelærer, Villa „Fryd", Tranebjerg, Samsø (1249) 1945
Larsen, Svend, Kommunelærer, Randersvej 55, Hobro (1391) 1948
Larsen, Edith, Fru, Randersvej 55, Hobro (1392) 1948
Melbye, Chr. F., Afdelingslæge, Rolighedsvej 7[1], Nørresundby (172) ...1917
Munk, Anders, Dr. phil., Ørnsøvej 78, Silkeborg (708) 1941
Munk, Ruth, Cand. mag., Fru, Ørnsøvej 78, Silkeborg (1079) 1944
Nygaard, Knud, Lektor, cand. mag., Egeskovvej 43, Fredericia (1011) 1943
Nørgaard, Kis, Fru, Havnegade 21, Esbjerg (1014) 1943
Olesen, Frode, Konsulent, Bidstrupvej 18, Hjørring (1237) 1945
Pedersen, K., Læge, Byrum, Læsø (1267) 1945
Rævskjær, H. V., Adjunkt, Vester Altanvej 36, Randers (428) 1933
Vestergaard, A., Cand. pharm., Krone Apoteket, Adelgade, Randers (961) 1943

Biblioteket for Silkeborg og Omegn, Silkeborg (381) 1932
Horsens Centralbibliotek, Løvenørnsgade 95, Horsens (620) 1938

8. *Sønderjylland*

Mundt, H., Arkitekt, Strandvej 13, Sønderborg (179) 1905
Terkelsen, Frede, Forstander, Danebod Højskole, Fynshav, Als (470) 1934
Weng, Ib, Læge, Nørregade 14, Haderslev (1284) 1946

b. Finland

Hägrén, Ernst, Fil. dr., Mannerheimvägen 33, Helsinki (426) 1933
Nyberg, Wolmar, Bankdirektør, Grankulla (447) 1933
Rautavaara, Toivo, Dr. agro., Mannerheim 56 B., Helsinki (1271) 1945

Helsingfors Universitets Botaniska Institution, Helsingfors (1345) 1947
Yliopiston Kasvipatologinen Laitos, Viikin, Koetila, Malmi, Helsinki (405) 1932

c. Norge

Eckblad, Finn, Hr., Hertzbergsgatan 7 A., Oslo (1363) 1947
Hagen, Asbjørn, Cand. mag., Botanisk Museum, Oslo (1424) 1948
Lunde, Bertel, Kirkesanger, Fjølbu Huvik, Sandar pr. Sandefjord (1431) 1949
Ramm, Wilhelm, Hr., Isegransgatan 5, Frederiksstad (1637) 1953
Robak, Håkon, Dr. phil., Vestlandets forstlige Forsøksstasjon, Bergen (400) 1932
Sooth, G., Dr. phil., Ski (954) 1943
Stordal, Jens, Lektor, Ski (1348) 1947
Størmer, Carl, Professor, Dr., Institut for teoretisk Astrofysikk, Blindern, V. Aker (397) 1932
Traaen, A. E., Professor, Landbrukshøjskolen, Vollebekk (401) 1932

Det Kgl. Norske Videnskabernes Selskab, Biblioteket, Trondheim (705) 1941
Soppforening i Bergen, Bergens Museum, Bergen (520) 1934
Statens Plantevern, Botanisk Avdeling (Dr. I. Jørstad) Oslo (125) 1946
Tromsø Museum Biblioteket, Tromsø (1645) 1953
Universitetets botaniske Museum, Oslo (406) 1932
Universitetsbiblioteket, Bergen (415) 1932

Dybwad, Jacob, Forlags- og Sortimentsbokhandel, Oslo (458) 1934

d. Sverige

Åkerblom, Lennart, Tandläkare, Linnégatan 5, Göteborg (1632) 1952
Andersson, Olof, Laborator, Fil. lic., Botaniska Laboratorium och Museum, Lund (619) 1938
Belin, H., Civilingeniör, Peterslundsgatan 6, Uppsala (1595) 1952
Degelius, Gunnar, Docent, Fil. dr., Ö. Slottsgatan 14 A[3], Uppsala (408) 1932
Ericsson, Wollmar, Hr., Kungsgate 43, Alingsås (1588) 1952
Fries, N. P. E., Docent, Fil. dr., Berggatan, Uppsala (413) 1932
Fries, Rob. E., Professor, Fil. dr., Floragatan 3, Stockholm (388) 1932
Fåhraeus, Gösta, Fil. dr., Kungl. Lantbrukshögskolan, Mikrobiologiska Institutionen, Uppsala 7 (1768) 1954

Färnmann, Sixten P, Kamrer, Nytorgsgatan 36 A, Stockholm SÖ (1278) 1946
Gehlin, Oscar, A/B Gehlins Fröhandel, Grönegatan 10, Malmö (1126) 1944
Hagemann, G. A., Hofjægermester, Godsejer, cand. polyt., Bergsjöholm, Ystad (78) 1913
Hjortsberg, L., Hr., Kungsgatan 61, Umeå (1581) 1951
Karlvall, Filip, Folkskollärare, Frölundsgatan 40, Göteborg (1580) 1951
Lundell, Seth, Fil. dr., Ringgatan 20 A, Uppsala (160) 1919
Nannfeldt, J. A., Professor, Fil. dr., Institutionen för Systematisk Botanik, Uppsala (396) 1932
Narfström, Ellis, Ingeniör, Salagatan 28 B[3], Uppsala (1429) 1949
Nathorst-Windahl, T., Direktör, Botaniska Trädgården, Göteborg (596) 1937
Persson, Per Brönd, Sockenwägen 541, Enskede (347) 1932
Rennerfelt, E. G., Fil. dr., Statens Skogsforskningsinstitut, Experimentalfältet (393) 1932
Santesson, Rolf, Fil. dr., Institutionen för Systematisk Botanik, Uppsala (1274) 1945
Stenlid, Göran, Fil. lic., Växtfysiologiska Institutionen, Lantbrukshögskolan, Uppsala 7 (1351) 1947
Suber, Niels, Agronom, Regeringsgatan 18[3], Stockholm (1582) 1951
Svensson, Harry, Lektor, Fil. dr., Börjegatan 42 A., Uppsala (392) 1932
Uddling, Åke, Läroverksadjunkt, Högre allmänna läroverket, Kristianstad (1371) 1948
Vallin, Hervid, Lektor, Fil. dr., Humetorpsvägen 115, Helsingborg (1499) 1950
Vold, A. L., Fru Professorinde, Vasagatan 1 C., Uppsala (1425) 1949
Woldmar, S., Folkskollärere, Björbäck, Uddevalla (1334) 1946

Göteborgs Botaniska Trädgård, Göteborg (394) 1932
Kungl. Vetenskapsakademiens Bibliotek, Stockholm 50 (610) 1937
Naturhistoriska Riksmuseum, Botaniska Avdelningen, Stockholm 50 (1273) 1945
Skogsbiblioteket, Experimentalfältet (435) 1933
Statens Växtskyddsanstalt, Stockholm 19 (1340) 1947
Uppsala Universitets Institution för fysiologisk Botanik, Uppsala (387) 1932

Björck & Börjesson, Bokhandel, Drottninggatan 62, Stockholm (1372) 1948
Fritzes, A.-B., Kgl. Hovbokhandel, Fredsgatan 2, Stockholm (436) 1933
Gleerupska Univ.-Bokhandeln, Lund (453) 1934
Lundequistska Bokhandeln, Uppsala (592) 1937

e. Andre Lande

Craig, J. K., Mr., Craigs Limited, Widnes, England (1728) 1954
Dodge, C. W., Professor, Dr., Missouri Botanical Garden, St. Louis, U.S.A. (427) 1933
Gäumann, E., Professor, Dr., Eidg. Technische Hochschule, Universitätsstrasse 2, Zürich, Schweiz (417) 1933
Geiger, Jakob, Vogelsang 165, Winterthur, Schweiz (1518) 1951
Groves, J. Walton, Dr. phil., Division of Botany, Department of Agriculture, Ottawa, Ont., Canada (1373) 1948
Holck-Larsen, H., Civilingeniør, P. O. Box 278, Bombay, India (1705) 1953
Palmer, J. T., Mr., 5, Station Road, Woodley, Stockport, Cheshunt, England (1636) 1953
Reichert, I., Professor, Pathological Institute, Agricultural Research Station, P. O. B. 15, Rehoboth, Israel (1584) 1952
Stevenson, John A., Principal Mycologist in Charge, 4113 Emery Place, N. W., Washington 16, D.C., U.S.A. (1344) 1947
Stunz, Daniel E., Professor, Dr., Botany Department, University of Washington, Seattle 5, Washington, U.S.A. (1600) 1952
Weintraub, A., Director, Dept. Medicine, Royal Scientists of America, 117 Lenox Road, Brooklyn 3, N. Y., U.S.A. (1538) 1951

Biblioteka Akademii, Nauk, Leningrad, U.S.S.R. (1435) 1949
Bibliotheek der Rijks-Universiteit te Leiden, The Chief-Librarian, Nonnensteeg 1, The Netherlands (1639) 1953
Birkbeck College, The Librarian, Malet Street, London W. C. 1, England (1505) 1950
Central Division of Plant Pathology, Library, University of California, U.S.A. (1458) 1949
Division of Mycology and Plant Discase, Plant Industry Station, Room 14, North Building, Beltsville, Maryland, U.S.A. (1521) 1951
Harward College Library, Cambridge, Mass., U.S.A. (1135) 1932
Indian Agricultural Research Institute, The Librarian, New Delhi, India (1422) 1948
Kansas State College, Library, Manhattan, Kansas, U.S.A. (1711) 1953
Library of Congres, Washington, DC., U.S.A. (1459) 1949
Michigan State College, Library, E. Lansing, Michigan, U.S.A. (1764) ... 1954
Officer in Charge, Division of Botany and Plant Pathology, Science Service Building, Ottawa, Ontario, Canada (1376) 1948

Pennsylvania State College, Agricultural Library, State College, Pa. U.S.A. (424) 1933
Royal Botanic Garden, The Regius Keeper, Edinburgh 4, Scotland (1292) 1946
State University of Iowa, Library, Serials Acquisitions, Iowa City, Iowa, U.S.A. (1513) 1950
University of Michigan, General Library, U.S.A. (1370) 1948
University of Minnesota, Agricultural Library, University Farm, St. Paul, Minnesota, U.S.A. (1643) 1953
Westdeutsche Bibliothek, Marburg, Deutschland (1766) 1954

Arnold Buscks Boghandel, København (Deutschland) (1462) 1950
Asher, A. & Co., Booksellers, 386, Heerengracht, Amsterdam, The Netherlands (1625) 1952
Friedländer & Sohn, R., Buchhandlung, Berlin-Charlottenburg 2, Knesebeckersstrasse 15, Deutschland (1720) 1954
Interscientia, Corso Garibaldi 34, Venaria reale, Torino, Italia (1633) 1953
M. Nijhoff, Booksellers, The Netherlands (1434) 1949
M. Nijmoff, Booksellers, The Netherlands (1519) 1951
Swets & Zeitlinger, Booksellers, Keizersgracht 471, Amsterdam C., The Netherlands (1613) 1952
Swets & Zeitlinger, Booksellers, Keizersgracht 471, Amsterdam C., The Netherlands (1729) 1954

FRIESIA V, 2: 135—160 — 1955.

DETTE HEFTE AF

FRIESIA

DER UDGIVES I ANLEDNING AF

„FORENINGEN TIL SVAMPEKUNDSKABENS FREMME"s

50 AARS JUBILÆUM DEN 1. OKTOBER 1955

ER TILEGNET MINDET OM

ELIAS MAGNUS FRIES

GRUNDLÆGGEREN AF

DEN MODERNE SYSTEMATISKE MYKOLOGI

THIS NUMBER OF

FRIESIA

WHICH IS ISSUED ON THE OCCASION OF

THE FIFTIETH ANNIVERSARY OF THE FOUNDATION OF

THE DANISH MYCOLOGICAL SOCIETY

IS DEDICATED

TO THE MEMORY OF

ELIAS MAGNUS FRIES

FOUNDER OF MODERN SYSTEMATIC MYCOLOGY

Elias Fries, aged 46.

Elias Fries is wearing the characteristic Swedish Doctor's Coat. From a lithograph executed by Joh. Cardon in 1840. Considered an excellent likeness by Elias Fries' family.

ELIAS FRIES' AUTOBIOGRAPHY, „HISTORIOLA STUDII MEI MYCOLOGICI"

INTRODUCTION

ELIAS MAGNUS FRIES (1794—1878), next to LINNAEUS the greatest Swedish botanist, is regarded as the founder of modern systematic mycology. Therefore, ELIAS FRIES must enter into the history of cryptogamic botany, especially of fungi, wherever and whenever that subject is historically considered.

As pointed out by WM. R. DUDLEY, the American mycologist, in a sketch of ELIAS FRIES, there is a curious parallelism extending throughout the entire careers of LINNAEUS and ELIAS FRIES. Thus DUDLEY (1886, p. 91) writes:

"Both were sons of country clergymen, and born in Småland, in the southern part of Sweden. Both, as lads, attended the school at Växjö, and both entered the University of Lund, although LINNAEUS remained there only one year, finally taking his degree at Upsala, while FRIES graduated at Lund. Both held for many years, as the crowning position of long and distinguished university careers, the professorship of Botany at Upsala, the most famous of the Swedish universities, where each died greatly beloved and honored. They were both voluminous in their authorship, — indeed, they have few parallels, in this respect, in botany, — and the period covered by the work of each also fairly represents the comparative difference in time in development of phaenogamic and cryptogamic botany. It has been said, furthermore, that FRIES was almost the last of that generation whose knowledge extended over all branches of the science as it was then understood and whose names were considered as authorities in all."

But whereas a bulky literature exists, both in and outside Sweden, about the life and work of LINNAEUS, surprisingly little has been written about ELIAS FRIES even in his native country. In Swedish his scientific activity is dealt with only sketchily by NYBLOM (1880), ARRHENIUS (1881) and ROB. E. FRIES (1933), and a minor biography has been drawn up by L. RYDEMAN (1915), based mainly on records of family traditions and personal reminiscences about ELIAS FRIES. Finally, TORE and GUNHILD FRIESIA ALMÉN have written about the ELIAS FRIES family's history (1945, 1953), but a complete biography with an exhaustive assessment of his importance to mycology is still missing.

Foreign literature has but few and very brief biographic accounts of FRIES. As far as it has been possible to trace, the most important of them are those given by JOHAN LANGE (1879), DUDLEY (1886), LLOYD (1909), KILLERMAN (1927), whose account of FRIES' life is probably the most detailed one out of Sweden, and M. VON LEINBURG (1928).

The principal source to the life and work of ELIAS FRIES, on which all the abovenamed biographic accounts are based extensively, is his autobiography, which he published in Latin under the title of "Historiola studii mei mycologici" in Vol. I of "Monographia Hymenomycetum Sueciae" (1857). In 1867 ELIAS FRIES started publication of the first fascicles of his big work of plates entitled "Icones selectae Hymenomycetum nondum delineatorum". Personally, however, he succeeded only in publishing Vol. I (fasc. 1—10), which was completed in 1875, and the first fascicle of Vol. II (1877). ELIAS FRIES died in 1878. The remaining nine fascicles of Vol. II were published in 1878—1884 by his two sons, TH. M. FRIES (1832—1913), lichenologist and professor of botany at Uppsala University; and ROBERT FRIES (1840—1908), mycologist and doctor of medicine in Gothenburg. On completion of the work, they reprinted their father's autobiography*) at the beginning of Vol. II, which they prefaced with a short biographical review and finished with a brief mention of their father's life after 1857, when the autobiography was published. Moreover, the biography was furnished with a portrait of their father and a list of all his mycologic works, seventy-five in all.

Considering that by far the larger part of the literature existing about ELIAS FRIES is written in Swedish and that his autobiography

*) For alterations introduced during reprinting, see p. 151.

is written in a Latin which is not always easy to understand and, moreover, published in works which are not readily accessible — "Monographia" was printed in 100 copies only and "Icones selectae" is a very costly work of plates — the Council of The Danish Mycological Society have found that the Society could celebrate its fiftieth anniversary in 1955 in no more dignified manner than by publishing an annotated English translation of ELIAS FRIES' autobiography, making the latter accessible to all the mycologic world.**)

The translation follows the text in "Icones selectae Hymenomycetum". Variations from the text of "Monographia Hymenomycetum Sueciae" are given as foot-notes where they cause a change in the translation (M stands for "Monographia"). Various typographical normalisations have been made.***)

**) The present translation is published simultaneously as an independent paper.

***) The translation from Latin into Danish was done by IB MAGNUSSEN, master of arts, classical philology, who also made out the list of Latin variations between the texts of "Icones" and "Monographia". The translation from Danish into English was done by Miss ANNIE I. FAUSBÖLL, M. A. The introduction, notes and editing are by N. FABRITIUS BUCHWALD. — The editors of "Friesia" hereby wish to acknowledge their gratitude to the two translators.

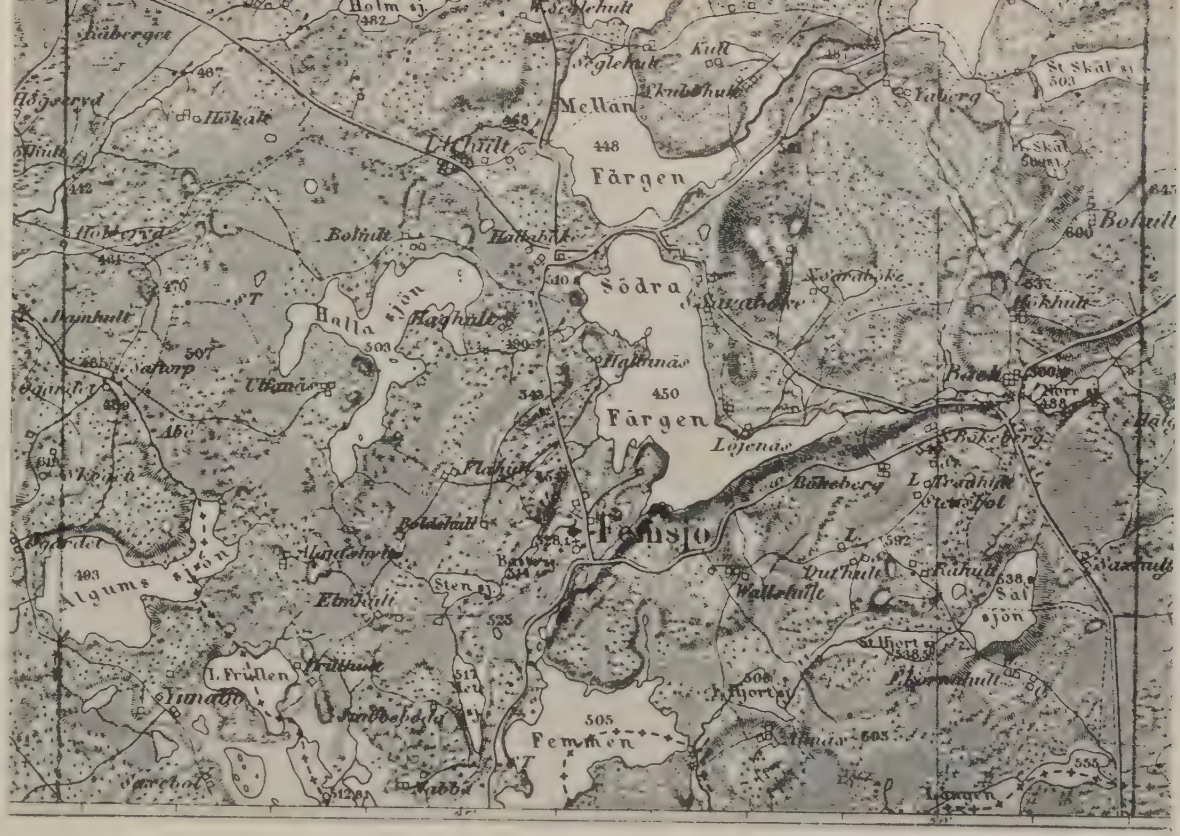

Fig. 1. *Femsjö and environment, after which the parish is named.*
The church and rectory are situated just west of the road running along the western side of the largest of the lakes, Södra Färgen, into the southwestern part of which the peninsula Hägnen projects. Elias Fries' love of Femsjö is evidenced by his flora "Stirpes agri Femsionensis" published in 1825—27. Cp. also "Svamplokaler ved Femsjö" (Fungus Localities near Femsjö), a manuscript left by Elias Fries and edited by fil. dr. Seth Lundell in "Friesia", vol. I, pp. 259—286, 1936. — From "Generalstabens karta över Sverige" (ordnance map of Sweden), 1:100.000. Reproduced with permission of Rikets Allmänna Kartverk, Stockholm, 5th Aug. 1955.

ELIAS FRIES' AUTOBIOGRAPHY

From "Icones selectae Hymenomycetum nondum delineatorum sub auspiciis Regiae Academiae Scientiarum Holmiensis editae ab ELIA FRIES. II, Holmiae et Upsaliae, MDCCCLXXVII—MDCCCLXXXIV, pp. I-IV".

Born on the 15th August 1794 in the parish of Femsjö in Småland, as the son of Dr. THEODOR FRIES, rector and rural dean, and his wife SARA ELISABETH WERNELIN, he attended primary and secondary school at Växjö, was admitted to the University of Lund in 1811, and already after three years took the degree of Phil. Dr. The same year — hardly 20 years old — he was appointed Lecturer in Botany at the University of Lund where until 1834 he was as sedulously occupied with the writing of his works as with teaching. In this period he was appointed to the post of Demonstrator Botanices in 1819, and to the chair of Professor regius in 1824.

In the year 1835 he exchanged his professorship in Lund for one in Uppsala where he resided until his death. Here, for 25 years, he discharged not only the duties of a professor but also many other important tasks with which he had been entrusted by the King, his colleagues, and his fellow citizens. After WAHLENBERG's death (1851) he took over the superintendance of the Botanical Garden and the Botanical Museum, from which post he retired in 1863. In his retirement, however, he did not enjoy his dignified leisure otherwise than by faithful and continued study of his beloved science, and though his health was precarious, to his very last days it was granted to him to retain the full enjoyment of his unimpaired faculties and his innate love of flowers. Finally, on the 8th February 1878 he passed away, satisfied with what he had accomplished during a long life and with the honours that had fallen to his share.

These few lines contain the account of an industrious and useful life. What he achieved in looking after the affairs of others, how much he contributed to special botany, particularly to our knowledge of the indigenous flora, what was his contribution to the founding of mycology, must of course be left to the judgment of others. But to follow the steps and the progress of the indefatigable explorer of the mysteries of mycology from the beginning — primarily in so far as the fungi of the higher taxonomic groups are concerned — should not be irrelevant to his posthumous work. In a brief narrative it is not possible to improve on what he tells us himself in his „Historiola

Fig. 2. *The beech wood in the peninsula of Hägnen.*
Hägnen is situated in the southwestern part of the lake Södra Färgen. Cp. the map Fig. 1. The beeches have just come into leaf. Phot. 11. May 1950 by E. Hellmers.

studii mei mycologici" (A short Account of my mycological Study)[1]) in approximately these words:

„In western Småland, between the rivulets Nissan and Lagan, lies an infertile and inclement tract of land with alternating mountains and forests, both deciduous and coniferous, where for 47 years my beloved father was rector of the church at Femsjö, and where I myself was born and brought up. This remote corner of the world is dearer to me than any other, and holds all the precious memories of my childhood. As no better-class boy of the same age was growing up in the neighbourhood, my father introduced me to the realm of Flora, (in his youth he had himself been fond of plants) that I might find companions among her children. Therefore I had already when I was twelve years old become acquainted with most of the more notable plants of the district. To this day, more than half a century later, I remember with gratitude the admiration that seized me when

[1]) Preface to »Monographia Hymenomycetum Sueciæ« Vol I, of which only 100 copies are in existence.

Fig. 3. *The road lined by birches leading from Femsjö church to the peninsula Hägnen.*
Cp. the map Fig. 1. — Phot. 11. May 1950 by E. Hellmers.

in 1806 I went with my mother to a burnt-down forest to pick strawberries and I there succeeded in finding an unusually large specimen of *Hydnum coralloides,* which was the first thing that induced me to study fungi. But when with the aid of the only book at hand (LILJEBLAD „Svensk Flora"), I wanted to examine my spoil, I was soon embarassed by a word I did not then know, namely *lamella.* So, shortly after, on a walk with my father I asked: *„Dic, pater, quid est lamella?"* („Tell me, father, what is lamella?"). For with my father I was not allowed to talk anything but Latin, for which reason I learnt Latin before Swedish. *„Lamella,"* he answered, *„est lamina tenuis",* and when I had received that explanation this term for the

fructification of the *Agaricaceae* seemed to me most ingenious, so that already the next day I could recognise the genera that were included in the above-mentioned book. But my progress in the knowledge of the species was slower, as I could not quite conceive that by far the greater number were not mentioned in our flora. In the year 1808, when the country was devastated by war with the allied neighbouring peoples on all sides,[a]) and the ravages of diseases following in the track of war spread far and wide, the school at Växjö which I attended as a boy and young man was closed; I then spent that year in the country, and I began to describe all the fungi I had found and to give them names that I had invented for the occasion. In this way I taught myself to distinguish 3-400 species before I left school. — In 1811 I and my class-mates took leave of Växjö and all proceeded to the University of Lund, even though I was drawn to Uppsala, the oldest seat of botanical learning in Sweden by a so to speak innate love; for our masters in the upper school[b]) had one and all advised us to beware of Uppsala on account of the Schellingianism[c]) and romanticism (in Sweden called Phosphorism[d]) then prevailing there. When we had come from Småland's mountains to Skåne's foggy plain, it seemed to my schoolfellows that they had descended to the Stygian fields,[e]) but I imagined that I had arrived at Elysium on account of the novelties which both the district and the University Library offered. Though the library lacked mycological books in the proper sense, only the student who has struggled with similar difficulties will be able to imagine with what delight I visited the Library every hour it was open, and in „Flora Danica", in JACQUIN's books, and on BUXBAUM's rough plates recognised the species so familiar to me, even though I did not know their names. There were especially two men who helped and supported me in my studies, the luminaries of Botany at Lund, one setting (A. J. RETZIUS), the other rising (C. A. AGARDH). They both at once met me with exceptional kindness and goodwill; the latter gave me PERSOON's „Synopsis Fungorum" to read, which I soon

a) In 1808—1809 Sweden was at war with Russia and, at the conclusion of peace in 1809, had to cede all Finland to Russia.
b) Upper school, in Swedish: gymnasium.
c) Schellingianism: the natural philosophy advocated by F. W. J. SCHELLING, the German philosopher (1775—1854).
d) Phosphorism: the name of the literary, romantic school (HAMMARSKIÖLD, ATTERBOM et alter) in Uppsala in the early part of the 19th century. The name originated from "Phosphoros", the journal of the school.
e) Styx: a river in Greece, the water of which, the myth has it, flowed into the lower world.

Femsjö in the early days of Elias Fries.

From an old oil painting in the possession of the Fries family. To the right the church where Thore Fries, Elias Fries' father, was rector. To the left is seen the old rectory where Elias Fries was born on the 15th August 1794. The rectory, which was demolished in 1854, stood directly NE of the present building. The American mycologist, G. C. Lloyd, was told by Professor Theodor M. Fries (1832—1913), the eldest son of Elias Fries, that "this oil painting is a very accurate representation of the surroundings at that time, as he well remembers it when a boy" (Lloyd 1910). — Cp. Plate III.

The church at Femsjö,
as it is today. Only a few minor changes have been made since the early days of Elias Fries. Cp. Plate II.
Phot. 11. May 1950 by E. Hellmers.

Fig. 4. *The deciduous forest on the peninsula Hägnen.* In the background the lake Södra Färgen is just visible. Phot. 11. May 1950 by E. Hellmers.

learnt from beginning to end, and the former gave me ALBERTINI's „Conspectus Fungorum Agri Niskiensis", a book which has given me knowledge of more things than any other. The next year I collected especially *Hyphomycetes* and epiphyllous fungi, which had so far been neglected, but I soon realised that the greater part of them are nothing but elementary stages of the, as we now say, higher ones; and these species always seemed to me mean and insignificant and not worthy of being recorded separately, except perhaps by those who are glad merely to increase[2]) the number of species. The very facility with which they could be described on the basis of the habitat

2) glad merely to increase...; M: glad to increase...

made me feel bored, as I enjoy the mere overcoming of difficulties. I never became acquainted with any fungal species from tradition but described them all independently[3]). — The year 1813, which abounded in storms and heavy showers, produced a richer crop of fungi than usual. Quite absorbed in my studies for a degree in philosophy, I wavered in perplexity between Homer and Flora[4]) until I had assigned definite hours to each of them. But when I had taken the academic degrees the following year and had been appointed Lecturer in Botany I could with a clear conscience devote myself entirely to mycology (without for that reason neglecting any part of the vegetable kingdom). In order to be able to consult the more important mycological works, a literature which I missed at Lund, I visited Copenhagen in November of that year and the next ten years, and there also I handed over to the publisher the manuscript for the first part of „Observationes Mycologicæ", containing chiefly the fungi I had collected in 1813. Just at this time, the excellent O. SWARTZ[5]), the most straightforward and humane of all the men I have known, who had laid the foundation[6]) of the study of mycology in Sweden, showed me exceptional kindness. At his invitation I began in the same year to write „Monographia Pyrenomycetum Sueciæ", which in 1816 I submitted to The Royal Academy of Sciences at Stockholm. The next year (1815) I spent in Småland and especially described *Hymenomycetes*. From this crop the second part of „Observationes Mycologicæ" is derived[7]).

Having learnt by experience that PERSOON's system is not sufficient, I began in 1816 to produce another, and to subject all species to an entirely new investigation. I very much regret that the construction of microscopes at that time was so imperfect that it was not possible to make any use of the finer parts. Every one will easily understand the skill that was needed to observe e. g. the spores of the *Hymenomycetes,* which up to that time had not been properly investigated, when the individual species were to be examined a second time to determine their [taxonomic] place; the system of *Agarics*

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3) them all independently; M: them all independently at that time.
4) between Homer and Flora...; M: between Homer and the fungi...
5) the excellent O. Swartz...; M: the excellent Swartz...
6) who had laid the foundation...; M: who was quite engrossed in helping others, and who had laid the foundation...
7) is derived. M: is derived. On account of the publisher's carelessness both are, however, to such a degree marred by misprints that I have considered it necessary to reproduce the descriptions in the book in an improved edition.

that I worked out that year has met with such general approval that hardly anybody has hitherto[8]) attempted to set up a new one. — In 1817, which was very rich in fungi, I collected a large crop of *Gasteromycetes* on my daily excursions, which have been described in the little book entitled „Symbolæ Gasteromycetum", and I wrote the first draft for „Systema Mycologicum" with the intention of comparing my collections with nature and adding to them the next year. In 1818, however, the fungus crop was so inconsiderable that I looked in vain for many fungi in the usual localities. Therefore, with greater caution than was actually necessary, I put aside many species with which I had already formerly become well acquainted, and others, in reality distinct, I grouped under the most closely allied species. In the autumn of 1819 I brought home a richer material from the Scanian woods, so that I could insert several species, collected on that occasion, in the first volume of „Systema Mycologicum", which was sent to press the same year and concluded the next year. The publisher, however, stated that the title page was to bear the date 1821.

In that year I wandered about the woods as was my habit especially studying *Discomycetes,* and I got ready my collection, already begun, for the „Scleromycetes Suecici", so as to lay the foundations of „Systema Mycologicum" II, the first part of which was published in 1822, the last part in 1823. The varying character of the forests (consisting of *Abies*[a]*), Pinus, Fagus, Quercus, Betula, Alnus, Populus, Tilia* and others) in the district at Femsjö and the copse in the flat Scania supplemented each other and greatly promoted these studies. What I wished most of all at that time was to visit more distant countries[9]); that, however, the straitness of my circumstances did not allow, and in those days — how much more fortunate you, who study nowadays! — there was no hope of obtaining public aid. Therefore I could not get about any further than my feet would carry me. But at that time, if you were tall and a good walker and in good health, it was not impossible to walk 75 km in 12 hours. When, however, in 1824, I had gone to central Sweden in the place to wander through the lichen localities of SWARTZ, WAHLENBERG, and ACHARIUS, on excursions in the skerries at Roslagen I was for a whole day exposed to showers and storms in an open boat, and after that I

8) approval that hardly anybody has hitherto...; M: approval that no one has hitherto...

a) Now: *Picea.*

9) visit more distant countries; M: visit the most remote countries;

was ill for a whole year. When I had given up all hope of recovery, to commemorate my native district I made out a list of „Stirpes Agri Femsjonensis" (in which fungi too are mentioned), and in order that various new finds and conceptions might be published, I dictated „Systema orbis vegetabilis" to my faithful friend N. O. AHNFELT[a]). But the next autumn (1825), when the fungi began to appear, I recovered my strength sufficiently to resume my former excursions, and in the winter I could in the first place investigate the so far too much neglected *Auriculae*[10]). At that time enormous amounts of fungi were sent to me from all countries, which I was daily occupied in determining; the new ones I have described in „Elenchus Fungorum" I-II, 1828[11]). When now MEYER and WALLROTH with much clamor and noise endeavoured entirely to set aside ACHARIUS' Lichenology, for whose fuller tradition I was responsible, I devoted a special study, in 1826-1827, to the lichens, which I had been very fond of from my childhood, and prepared several emissions of „Lichenes Suecani Exsiccati" (fascicles I-III of the first emission appeared in 1817 together with the new „Lichenum Dianome"), so that I could at least preserve the finest things. In 1828 I visited North Germany and especially the Museum at Berlin; when I had returned I completed the first part of „Systema Mycologicum" III, and the following year „Eclogæ Fungorum" from the Berlin Museum and my old friend KUNZE's herbarium. When I had finished this I was occupied with the arrangement of the European Lichenology. At the urgent request of the publisher I was, however, in 1831, against my will obliged to proceed to the last part of the work „Systema Mycologicum" since the eminent KUNZE, who had undertaken this work, had postponed the matter. That is the reason why I have only dealt briefly with these species, which are difficult to identify and wonderfully heterogeneous in form (though in themselves without any great significance, as e.g. the *Uredinei,* which I would not spend time and paper on enumerating).

In the immediately succeeding years, while searching for other things, I at the same time collected[12]) many more remarkable *Hymenomycetes,* the description of which I, however, preferred to associate with a general investigation sooner than giving scattered contribu-

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a) Lecturer in the faculty of theology at Lund University.

10) investigate the so far too much neglected Auriculae. M: investigate the too neglected Auriculae.

11) I-II, 1828; M: I-II, 1827-28.

12) I at the same time collected...; M: I had at the same time collected...

tions which I had often seen[13]) would increase rather than diminish the difficulties of a deeper study. Therefore, though „Systema Mycologicum" was hardly finished yet, for the third time I started quite afresh on the study of the fungi, using my earlier works as if they had been written by some one else, and investigated everything anew with more ample material. In the summer and autumn seasons of 1832-1834 I wandered about the forests every day, observing *Hymenomycetes* and especially *Cortinarii,* and once more or several times comparing the given definitions with nature; in winter and spring I gathered *Pyrenomycetes* and examined them under the microscopes which since the publication of „Systema Mycologicum" had been improved and made more powerful in a most admirable way. In the winter of 1832-33 a very rich collection of lichens was issued, in 1833-1834 a collection of *Pyrenomycetes.* In „Flora Scanica" in 1835 I advanced a proposal for an improved and increased subdivision, where the *Discomycetes* were separated from the *Hymenomycetes* etc., which I had worked out during these years. After I had settled for good in Uppsala I could soon see that I had been transported so to speak to a new fungal world; I gathered an extensive crop of *Cortinarii, Hydni* etc. and during indefatigable excursions in 1835-1837 I brought to light many other species not formerly collected. „Epicrisis Systematis Mycologici" was sent to press in December 1836[14]) but what with the trouble of putting the finishing touches to the work (e.g. each synonym had to be accounted for several times) was not completed until June 1838. I should hardly think that any other botanical work of the kind is based on more persistent or long-continued observations in nature itself or on a more thorough and difficult study of the literature from the earliest times. The very conciseness and briefness, with an almost lapidary style and omission of everything of which it was not possible to form any clear idea, required great effort. I also intended to work up a similar new survey of the *Ascomycetes* based on 600 new analyses. But my contemporaries, with CORDA at their head, who were without special knowledge of the higher fungi[15]), did not attach the importance to the matter that it deserved (I am glad that the better informed people now to be found appreciate my efforts), for which reason I, who would not spend

13) which I had often seen...; M: which I have often seen...
14) in December 1836...; M: in January 1837...
15) with Corda at their head, who were without special knowledge of the higher fungi...; M: with Corda, who was without special knowledge of the higher fungi, at their head...

time, strength, and money on so thankless a study, resolved to cultivate it exclusively for my amusement[16]) [17]).

But in the year 1844 the Royal Academy of Sciences in Stockholm decided that all species in particular of *Hymenomycetes* which cannot be preserved in the dried state should be depicted at the expense of the Academy, and charged me with the superintendence of the preparation of the pictures. Upon this I finally, for the fourth time, started afresh on my studies of the *Hymenomycetes*. During the last 12 years almost just as many hundred species have been depicted in lifelike figures with their natural colours, and when they have been published, it may be allowed to hope[18]) that a lasting foundation will have been laid for the determination of the species[19]).

In the evening of my life it is a pleasure to me to remember the great delight I have found in the study of the higher fungi, continued for more than 50 years. Even though I have not neglected the study of any part of the vegetable kingdom in its peculiarities, the fungi have always above all been near to my heart. The enormous amount of species intimidate most people, but the number of the *Hymenomycetes* is not infinite like that of the so-called epiphyllous fungi which must therefore be treated in another way; I am glad that in the course of the last 12 years I have only discovered few new ones[20]). So then I recommend the study of them to botanists living in the country as a lasting source of pleasure and of admiration for the wisdom which governs all Nature." — —

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16) for my amusement; M: for the sake of pleasure and amusement.

17) Since that time I have only published brief communications with descriptions of »Fungi Preissiani« in LEHMANN's »Plantæ Preissianæ«, »Wahlbergiani« from Natal in Proceedings of the Royal Academy of Sciences; »Afzeliani« and those of the Copenhagen Museum from Guinea, »Liebmanniani« from Mexico, to which are added several from the USA, »Oerstediani« from the West Indies and Costa Rica, »Didrichseniani« and »Kamphöveneriani« from the Nicobar Islands and Pacific Islands in Acta Reg. Soc. Ups. as well as »Novi Hymenomycetes in Suecia detecti« in the Proceedings of the Royal Academy of Sciences. Further I have published various writings in Swedish which refer to the use and biology of the fungi of which I would especially call the attention of mycologists to »Calendarium Fungorum« (»Calendar of the Fungi«).

18) it may be allowed to hope...; M: I hope...

19) the species; M: the species. Since, however, the expense of so large a work at the present will act as a deterrent, I have considered it convenient to publish this commentary to the figures, so that all descriptions of the species collected by me which are scattered over various books, may be gathered in one place. But since a publication of this kind will find few readers, it has only been printed in 100 copies.

20) discovered few new ones; M: discovered very few new ones.

Non languescit amor senectute (SENECA)[21]). During the last 15 years of his life, after he had written the above account (1863)[22]), he diligently followed the progress made within the whole field of botany, though he felt a special pleasure in dwelling upon the study of the *Hymenomycetes*. Besides various small works of minor importance published during these years, a large and weighty volume, „Hymenomycetes Europæi" („Epicrisis Systematis Mycologici", ed. II), came from the press on his eightieth birthday as evidence of the old man's steady and intense energy. He also lived to see that the figures of *Hymenomycetes* which he had procured from the various parts of his country over a great many years were at last to be published at the public expense. In the years 1860-66 there appeared „Sveriges ätliga och giftiga Svampar" („The Edible and the Poisonous Fungi of Sweden") and in 1867 he started editing the present work,[a]) 11 fascicles of which were published in his lifetime. He was most anxious that the work begun should be fitly carried to an end; feeling plainly beforehand that it would not be granted to him to do so, he outlined the main contents of the work in his posthumous papers, stating especially which plates were to be selected — at any rate as far as the greater part was concerned. And on the very last day, when he passed away quietly in the evening, he spoke vivaciously of this matter and expressly instructed us as far as we could to publish the work till the end. This task we have now tried to perform with all the reverent affection that is fitting for sons.

It is not for us to extol our late father. Science clothes itself in a new form from day to day; what seemed well supported yesterday will perhaps be accounted dubious or false tomorrow. Still, a far posterity will testify for a certainty that his ardent unabated zeal for promoting science, continued through more than 70 years, has by no means been fruitless.

A complete list of his works in so far as they are concerned with mycology is given below.[b]) For the student who avails himself of these in the study of fungi, there will in doubtful cases often be further, not inconsiderable aids at hand:

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21) i. e. Love is not wearied with age.

22) 1863 is apparently a mistake. Vol. 1 of "Monographia Hymenomycetum Sueciæ", which contains FRIES' autobiography, appeared in 1857, whereas vol. 2 appeared in 1863. "The last 15 years" thus will be "the last 21 years".

a) i. e. "Icones selectae.....".

b) This list is omitted here. Compare the list of mycologic and lichenologic works of ELIAS FRIES on p. 154.

Fig. 5. *The present rectory at Femsjö.*
The rectory was built in 1854, directly SW of the old rectory, which was demolished the same year. To the left of the building is seen an old ash, under which a memorial stone was erected in 1932. Cp. Fig.7. Phot. 11. May 1950 by E. Hellmers.

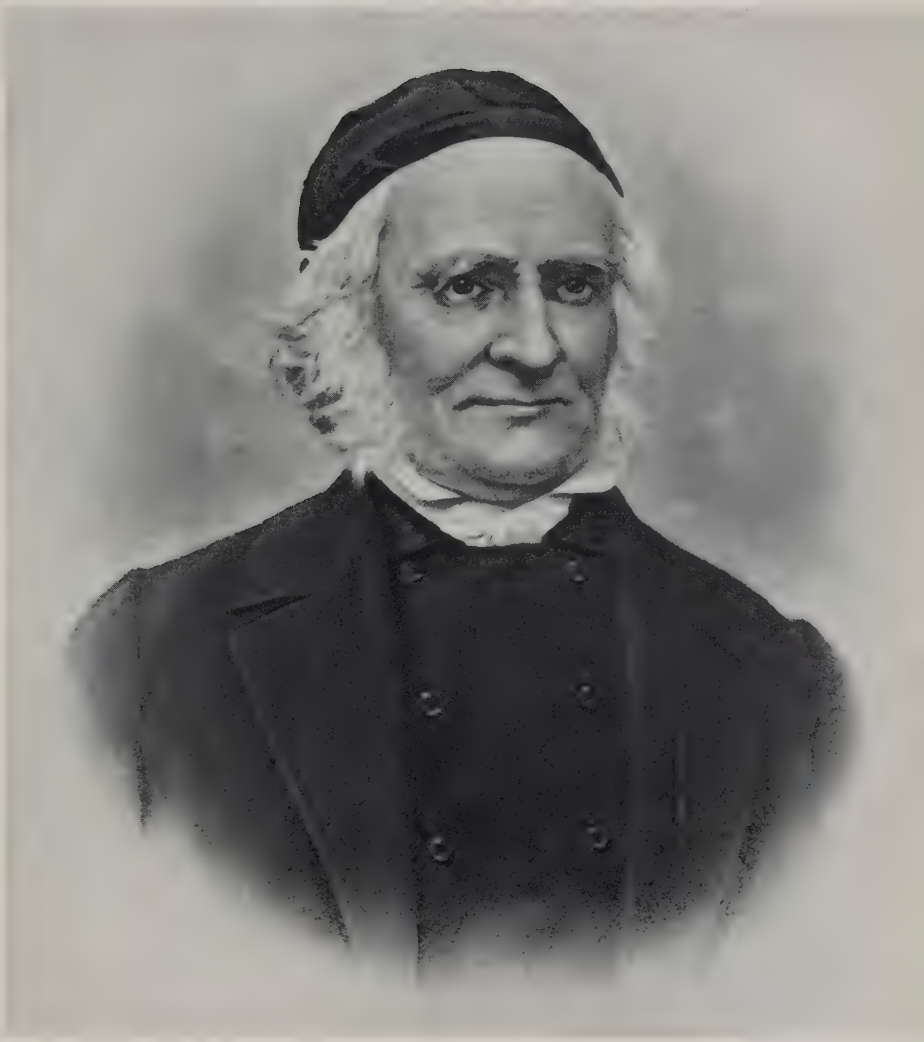
I.) A comprehensive and valuable collection of pictures of fungi prepared under his own direction, kept in the Museum of the Academy of Sciences in Stockholm (it is to be deplored that more than two hundred which especially contained figures of *Clitocybe, Collybia, Omphalia,* and *Mycena* perished in the disastrous fire in 1876);

II.) A herbarium, which also contains a number of dried fungi acquired for the University of Uppsala;

III.) A large number of plates with fungi drawn under his direction or received from foreign mycologists from all parts of the world, also kept at the University Museum of Uppsala;

IV.) A good many mycological notes, as yet unprinted, deposited in the same place;

V.) A vast amount of letters from botanists in Europe and outside Europe, among which are letters from most of the mycologists of this century. This collection will shortly, when it has been arranged, be handed over to the University Library at Uppsala.



Elias Fries at the time when he published "Icones selectae Hymenomycetum."
From the portrait in Vol. II of "Icones selectae Hymenomycetum."
Copy of a photograph.

The portrait subjoined to this work has happily rendered the ageing author's expressive face.[23]) But a more radiant image of the honest teacher, the noble interpreter of nature, lives in the loving memory of his children, his pupils, his associates, and his friends.

Uppsala and Göteborg in May 1884.

TH. M. FRIES. ROB. FRIES.

COMPARISON OF THE TEXTS IN "ICONES" AND "MONOGRAPHIA"

In their republishing of ELIAS FRIES' autobiography from "Monographia" his sons have made some revisions of the Latin text, most of them, however, of minor importance. Punctuation and use of capital letters have been revised, and ae has been replaced by æ. Further some errata and incorrect grammatical forms have been corrected, non-current phrases have been substituted by more current phrases, and some abbreviated words have been written in full. More important, however, are the following revisions: a few statements have been cautiously toned down, pieces of information, which apparently were not quite correct, have been amended, and a few omissions have been made. On the whole, the revisions made by ELIAS FRIES' sons have improved the language of the text.

Below is given a list of all variations in the two Latin texts, apart from those which only concern punctuation, the use of capitals, abbreviations and the substitution of æ for ae. Roman and Arabic numerals refer to page and line, respectively, in "Monographia". M stands for "Monographia" and I for "Icones".

M V 5: acerosis; I: acifoliis.
M V 5: variegata; I: distincta.
M V 8: nobis; I: mihi.

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[23]) Cp. Plate IV.

M VI 4: lacerabatur et; I: lacerabatur.
M VI 5: vagabantur; I: vagabantur et.
M VI 6: clausa, ruri degebam, omnes; I: erat clausa, rure degens omnes.
M VI 11: petimus; I: petiimus.
M VI 18: demersis; I: demersi.
M VI 19: tum regio ipsa, tum Bibliotheca Academica; I: tam regio ipsa, quam bibliotheca academica.
M VI 28: Rezius; I: RETZIUS.
M VI 31: Albertini; I: ALBERTINII.
M VI 35: esse, nisi; I: esse quam.
M VII 3: aucto gaudent; I: aucto tantum gaudent.
M VII 3: ex loco; I: e loco.
M VII 4: in difficultatibus vincendis tantum gaudio afficerer; I: difficultatibus vincendis tantum gauderem.
M VII 6: propria Marte tum temporis determinavi; I: proprio Marte determinavi.
M VII 7: meteoribus; I: meteoris.
M VII 10: Fungos; I: Floram.
M VII 11: insequenti; I: sequente.
M VII 21: Swartzius; I: O. SWARTZIUS.
M VII 22: noverim; I: novi.
M VII 22: qui aliis inserviendo consumebatur, et fundamenta; I: qui fundamenta.
M VII 26: Sequenti; I: Sequente.
M VII 28: ex qua; I: e qua.
M VII 29—31: Bibliopolae autem neglegentia..... necesse duxerim; I: ÷.
M VIII 6: nemo; I: vix quisquam.
M VIII 7: quotidianis factis excursionibus; I: quotidianis excursionibus.
M VIII 9: descriptarum; I: descriptorum.
M VIII 11: sequenti; I: sequente.
M VIII 19: sequenti; I: sequente.
M VIII 29: remotissimas; I: remotiores.
M VIII 34: et agili; I: agilique.
M IX 5: ex quo; I: e quo.
M IX 10: sequenti; I: sequente.
M IX 11: emergentibus; I: cum emergentibus.

M IX 13: nimis neglectos; I: nimis hactenus neglectos.
M IX 16: I, II 1827-28; I: I-II 1828.
M IX 19: molierentur; I: molirentur.
M IX 24: Musæum; I: Museum.
M IX 25: vol. III: tiae; I: vol. III:tii.
M IX 26: sequenti; I: sequente.
M IX 26: ex Mus. Berol. et amici; I: e Museo Berolinensi et herbario amici.
M IX 31: causa; I: caussa.
M IX 36: legeram; I: legi.
M IX 36: quarum; I: quorum.
M X 3: expertus sum; I: expertus eram.
M X 16: Hymenocetibus; I: Hymenomycetibus.
M X 21: Januario 1837; I: Decembri 1836.
M X 29: lapideo; I: lapidario.
M X 33: rudi; I: rudes.
M XI 1: animi voluptatis que; I: voluptatis.
M XI 2: colore; I: colere.
M XI 5: sumtibus; I: sumptibus.
M XI 11: speramus; I: sperare licet.
M XI 11—16: Quum vero tanti..... exscripta sunt; I: ÷.
M XI 19: excurit; I: excurrit.
M XI 23: s. d.; I: quos dicunt.
M XI 24: perpaucas; I: paucas.
M XI 25: novas; I: novas species.
M XI 29: Fungi Wahlbergii; I: Wahlbergiani.
M XI 30: Fungi Afzeliani; I: Afzeliani.
M XI 30: Mus. hafn.; I: Musei Hauniensis.
M XI 31: Fungi Lieb.; I: Lieb.
M XI 32: Oerstedii; I: Oerstediani.
M XI 32: Didrichsenii et Kamphöveneri; I: Didrichseniani et Kamphöveneriani.
M XI 33: pacifici insulis; I: pacifici.
M XI 37: commendarem; I: commendatum volo.

MYCOLOGIC AND LICHENOLOGIC WORKS OF ELIAS FRIES MENTIONED IN HIS AUTOBIOGRAPHY

"Novitiae florae Sueciae." (Diss. acad.). 1814. — The degree of doctor of philosophy was conferred on ELIAS FRIES on the basis of this thesis, and the same year he became botanices docens at Lund University. — P. 144.

"Observationes mycologicae praecipue ad illustrandam floram Suecicam". Pars I, 1815, pars II, 1818. Ed. nova 1824. — P. 144.

"Lichenum Dianome nova". (Diss. acad.). 1817. — P. 146.

"Symbolae Gasteromycetum ad illustrandam floram Suecicam". (Diss. acad.). 1817—18. — P. 145.

"Specimen systematis mycologici". (Diss. acad.). 1819. — The first draft of "Systema Mycologicum". — P. 145.

"Scleromyceti Sueciae". Decad. I-XLV. 1819—1834. — This exsiccate work is in the autobiography called "Scleromycetes Suecici". — P. 145.

"Systema Mycologicum". Vol. I-III. 1821—1832. — P. 145, 146.

"Lichenes Sueciae exsiccati". Fasc. I-IV, VII-IX and XIII. 1824—27. — The remaining fascicles were published by CHR. STENHAMMAR and TH. M. FRIES. — P. 146.

"Systema orbis vegetabilis. Pars I. Plantae Homomeae". 1825. — P. 146.

"Stirpes Agri Femsionensis, et continuatio I-VI" (Diss. acad.). 1825, 1827. — P. 146.

"Elenchus Fungorum, sistens commentarium in Systema Mycologicum". Vol. I-II, 1828. — P. 146.

"Eclogae Fungorum praecipue ex herbariis Germanorum descriptorum". Linnæa 5: 497—553, 1830. — P. 146.

"Lichenographia europaea reformata". 1831. — The principal lichenologic work of E. FRIES. — P. 146.

"Corpus florarum provincialium Sueciae. I. Floram Scanicam scripsit —.". 1835. — P. 147.

"Epicrisis Systematis Mycologici". 1836—38. — P. 147.

"Fungi Natalenses, quos annis 1839—41 collegit J. A. Wahlberg". Sv. Vet. Akad. Handl. 1848, I, p. 121—154. — Also published under the title of "J. A. Wahlbergii Fungi Natalenses .....". 1848. — P. 148.

"Hymenomycetes in Suecia nuper detecti .....". Sv. Vet.-akad. Öfvers. 8, p. 42—54. 1851. — P. 148.

"Novae symbolae mycologicae, in peregrinis terris a botanicis Danicis collectae", Acta Reg. Soc. Sc. Upsal., ser. III, vol. 1, p. 17—136. Uppsala 1851. — This work describes fungi collected by the Danish botanists: F. M. LIEBMANN (1813—1856) in Mexico (1840—1843) ("Fungi Liebmanniani"), A. S. ÖRSTED (1816—1872) in the West Indies and Costa Rica (1845—48) ("Fungi Oerstediani"), F. DIDRICHSEN (1814—1887) and B. KAMPHÖVENER (1813—1846) on the Galathea expedition (1845—47) to the Nicobar Islands and islands in the Pacific ("Fungi Didrichseniani" and "Fungi Kamphöveneriani"), as well as fungi gathered by A. AFZELIUS (1750—1837), the Swedish botanist, in West Africa (Guinea) ("Fungi Afzeliani"). — P. 148.

"Hymenomycetes, novos et rariores, anno 1851 in Suecia observatos, recenset". Sv. Vet.-akad. Öfvers. 9, p. 127—131. 1852. — P. 148.

"Svamparnas Calendarium under medlersta Sveriges horisont". Sv. Vet.-akad. Öfvers. 14, p. 137—155. 1857. — P. 148.

"Monographia Hymenomycetum Sueciae". I, 1857; II, 1863. — Vol. I contains on pages V-XI the autobiography of E. FRIES: "Historiola studii mei mycologici". — P. 149.

"Sveriges ätliga och giftiga Svampar, tecknade efter naturen under ledning af E. FRIES." 1860—1866. — P. 149.

"Hymenomycetes novi vel minus cogniti, in Suecia 1852—60 observati". Sv. Vet.-akad. Öfvers. 18, p. 19—34. 1861. — P. 149.

"Icones selectae Hymenomycetum nondum delineatorum. Sub auspiciis Regiae Academiae Scientiarum Holmiensis editae ab Elia Fries". Vol. I, fasc. 1—10, 1867—1875; vol. II, fasc. 1—10, 1877—1884. — Vol. II, fasc. 2—10, was published 1878—84 by TH. M. FRIES and ROB. FRIES and contains on pages I—VII a reprint of the autobiography of E. FRIES, a list of his mycologic works, and his portrait. — P. 149.

"Hymenomycetes Europaei sive Epicriseos Systematis Mycologici editio altera". 1874. — P. 149.

Lists of ELIAS FRIES' botanical works are to be found in PRITZEL: "Thesaurus literaturae botanica", ed. 2, 1872—77, in "Icones selectae Hymenomycetum", vol. II, 1877—84, in WITTROCK: "Illustrerad förteckning öfver Bergielunds botaniska trädgårds samling porträtt af botaniska författare", II, 1905, p. LXIX—LXXI, and especially in KROK: "Bibliotheca botanica Suecana," 1925.

Fig. 6. *The church at Femsjö*
as it is today.
Cp. Plates II and III. — Phot. 11. May 1950 by E. Hellmers.

NOTES ON THE BOTANISTS MENTIONED IN ELIAS FRIES' AUTOBIOGRAPHY

ACHARIUS, ERIK (1757—1819), Swedish physician and botanist; author of a great number of lichenologic works, e. g. "Lichenographia universalis" (1810); considered the founder of lichenology. — P. 145, 146.

AGARDH, C. A. (1785—1859), a prominent Swedish systematist and algologist; professor at Lund University 1812; bishop 1834. His works laid the foundation of algology. — P. 142.

ALBERTINI, J. B. DE (1769—1831), a German mycologist, who, jointly with L. D. DE SCHWEINIZ, the German-American mycologist (1780—1834), published "Conspectus fungorum in Lusatiae (i. e. Lausitz in Silesia) superioris agro Niskiensi crescentium". — P. 143.

BUXBAUM, J. C. (1693—1730), professor in St. Petersburg. Author of "Plantarum minus cognitarum centuriae", I-V, 1728—1740. — P. 142.

CORDA, A. J. (1809—1849), Bohemian mycologist, who published works on microscopic fungi. His principal work is "Icones fungorum", I-V. 1837—1842. — P. 147.

JACQUIN, N. J. (1727—1817), Austrian botanist; professor of botany and director of the botanical gardens of Vienna (1768—97), later of the imperial garden at Schönbrunn as well; published a number of big illustrated works. — P. 142.

KUNZE, G. (1793—1851), a German mycologist, who published, jointly with J. K. SCHMIDT, "Mykologische Hefte", I-II, 1817—1825. — P. 146.

LEHMANN, J. G. C. (1792—1860), a German botanist, who published "Plantae Preissianae" I-II, Hamburg 1844—1847 (Plants gathered by L. PREISS in Australasia, among which the fungi were determined by E. FRIES: "Fungi Preissiani", II, p. 130—140). — P. 148.

LILJEBLAD, SAMUEL (1761—1815), professor at Uppsala University; published in 1792, in Swedish, the first flora in Sweden in the modern sense of the word: "Utkast til en Svensk Flora" ("Draft of a Swedish Flora"); 2nd ed. 1798; 3rd ed. 1816. — P. 141.

MEYER, G. F. W. (1782—1856), German botanist and lichenologist. — Author of "Die Entwicklung, Metamorphose und Fortpflanzung der Flechten, 1825. — P. 146.

PERSOON, C. A. (1755—1836), born in Capetown, botanist and mycologist. His principal mycologic work: "Synopsis methodica fungorum" was published in 1801. — P. 142, 144.

RETZIUS, A. J. (1742—1821), Swedish botanist of note; professor at Lund University 1781—1812. — P. 142.

SWARTZ, OLOF (1760—1818), Swedish botanist; professor in Stockholm 1791—1818. — P. 144, 145.

WAHLENBERG, GEORG (GÖRAN) (1780—1851), pharmaciae professor regius 1826 at Uppsala University; medicinae et botanices professor at Uppsala 1829—1851. One of the principal founders of Plant Geography. — P. 139, 145.

WALLROTH, F. W. (1792—1857), German botanist and physician; published, among other works "Naturgeschichte der Flechten" (1825—1827). — P. 146.

Fig. 7. *The memorial stone to the Fries family at the foot of the ash tree in Femsjö rectory garden.*
The stone was erected in 1932, on the hundredth anniversary of the birth of the lichenologist Theodor (Thore) Magnus Fries, Professor of Botany at Uppsala. It has the inscription printed on the following page.
Phot. 11. May 1950 by E. Hellmers.

I FEMSJÖ
LEVDE, VERKADE OCH DOG
PROSTEN THORE FRIES,
FÖDDES OCH FOSTRADES SONEN
BOTANISTEN ELIAS M. FRIES,
FÖDDES SONSONEN
BOTANISTEN THORE M. FRIES,
VERKADE SONSONSONEN
LÄKAREN ELIAS A. FRIES.*)

*) At Femsjö lived, worked, and died
Dean Thore Fries,
was born and grew up his son
the botanist Elias M. Fries,
was born his grandson
the botanist Thore M. Fries,
worked his greatgrandson,
the physician Elias A. Fries.

The inscription of the memorial stone to the Elias Fries family. Cp. Fig. 7.

LITERATURE ON ELIAS FRIES

Almén, Tore & Gunhild Friesia Almén: Elias-Fries-släktens historia. Anteckninger. Stockholm 1945.

Almén, Gunhild Friesia: Tillägg till Elias-Fries-släktens historia. Stockholm 1953.

Arrhenius, J.: Elias Magnus Fries. Minnesteckning föredragen på Kongl. Vetenskaps-Akademiens högtidsdag den 31. Mars 1881. — Lefnadsteckningar öfver Kongl. Svenska Vetenskaps Akademiens ledamöter 2: 195—226, 1881.

Birger, Selim: Carl von Linnés och Elias Fries barndomshem. Några utdrag ur litteraturen. — Svenska Turistföreningens Årsskrift 1916: 141—149, 1916.

Dudley, Wm. R.: Elias Magnus Fries. — Journ. Mycology 2: 91—94. Manhattan, Kansas 1886.

Fries, Rob. E.: Tal hållet i Femsjö kyrka den 11. september 1932 vid invigningen av minnesstenen å Femsjö Prestgård. Uppsala 1933.

— A short History of Botany in Sweden. Pp. 5, 39, 53, 61, 134. — Seventh Internat. Botan. Congress, Stockholm 1950. Uppsala 1950.

Högrell, B.: Botanikens historia i öfversigt. Pp. 114—118, 123—125, 132, 196—198, 207—209, 247—254. Göteborg 1886.

Killermann, S.: Elias Fries (1794—1878). — Zeitschr. Pilzkunde 6 (N. F.): 33—38, 49—56, 65—68. Leipzig 1927.

Krok, Th. O. B. N.: Bibliotheca Botanica Suecana ab antiquissimis temporibus ad finem anni MCMXVIII. Pp. 199—215. Uppsala & Stockholm 1925.

Lange, Joh.: Mindeord over Elias Fries. — Botan. Tidsskrift 11: 22—25. København 1879—80.

Leinburg, M. von: Zum 50. Todestag des schwedischen Botanikers Elias Fries. — Zeitschr. Pilzkunde 7 (N. F.): 17—19. Leipzig 1928.

Lloyd, C. G.: Elias Magnus Fries. — Mycological Notes 32: 414—424. Cincinnati, Ohio 1909.

— Femsjö in Fries' day. — Mycological Notes 36: 480—482. Cincinnati, Ohio 1910.

Nyblom, Carl Rupert: Inträdes-tal i Svenska Akademien den 20. december 1879. — Svenska Akad. handlingar 56: 13—65. Stockholm 1880.

Rydberg, V.: Svar på herr Nybloms inträdes-tal. — Ibid. 56: 66—69. Stockholm 1880.

Rydeman, Lamech: Om Elias Fries. Släkttraditioner och personliga minnen. Lund 1915.

Wittrock, Veit Brecher: Illustrerad förteckning öfver Bergielunds botaniska trädgårds samling porträtt af botaniska författare; jämte biografiska notiser. Pp. 38—39, 183. — Acta Horti Bergiani. Band 3. N:o 2. Stockholm 1903. — 2: dra delen. Pp. LXIX—LXXI, 12. Ibid. Band 3. N:o 3. Stockholm 1905.

Copenhagen, September 1955.

Friesia . Bind V, Hefte 3—5, Side 161—432, 1956.

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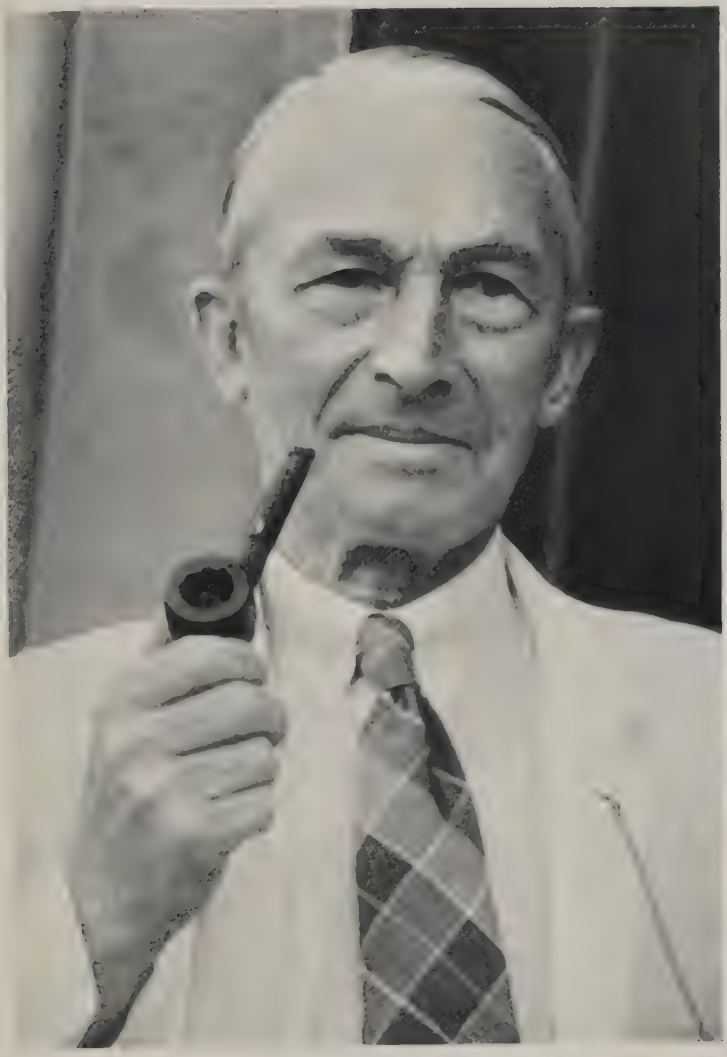

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THE INHERITANCE OF ENZYMATIC CHARACTERS IN YEASTS

By CATHERINE ROBERTS

Lecture presented in Copenhagen at the 1951
Microbial Genetics Symposium

Introduction

In the following I would like to discuss the problem of the inheritance of enzymatic characters in the yeast fungi and, in doing so, to attempt to review critically the available evidence in support of mendelian and non-mendelian heredity in these organisms. Such an attempt will necessarily involve a discussion of enzymatic adaptation in its bearing upon yeast genetics, especially since current views offered in explanation of this phenomenon are as widely divergent as those which attempt to explain the mechanism of gene transmission. Since the contributions to yeast genetics have been exceedingly numerous, I propose to treat the subject chronologically in order to trace the developments within the field in as clear and unambiguous a manner as possible.

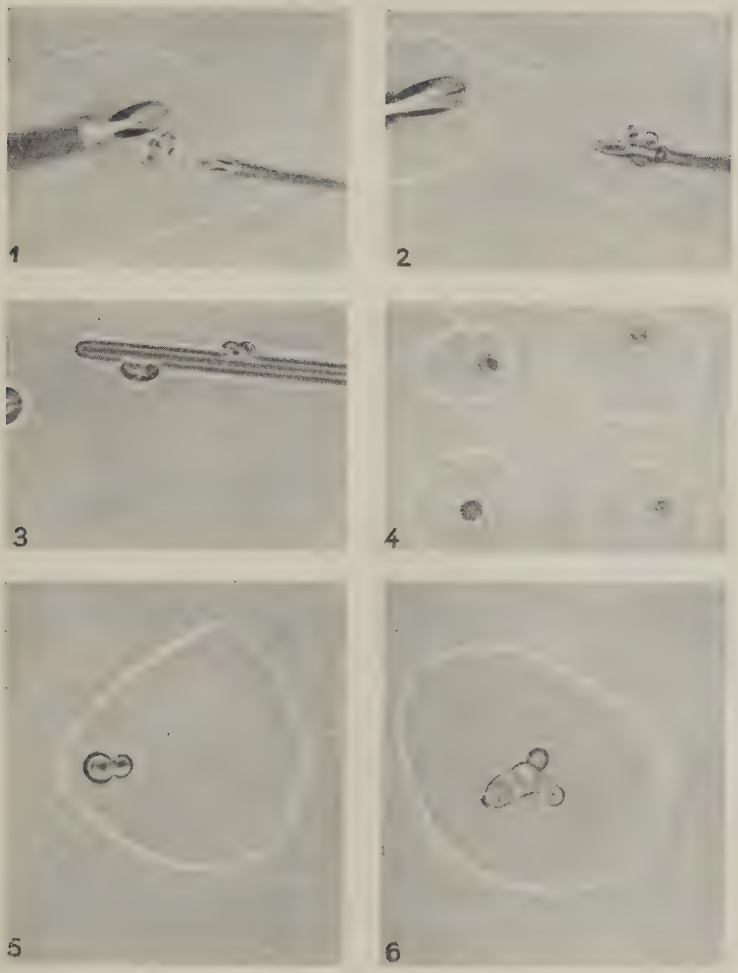
1935—1939

The year 1935 can be taken as a starting point, for it was in this year that a paper by Professor WINGE entitled "On Haplophase and Diplophase in some Saccharomycetes" appeared, in which the complete life cycle of *Saccharomyces*, including sexuality, sporulation, and alternation of generations, was incontestably established. As LINDEGREN has aptly remarked in his recent book, "The Yeast Cell", it was WINGE "who brought yeast genetics into being", for with this 1935 paper as a basis, there followed in the years 1937—1939 a series of now classical papers by Professor WINGE and his collaborator LAUST-

SEN, in which the yeast fungi were, for the first time, employed in the field of genetics. With the aid of the micromanipulator, they were able to isolate each of the 4 spores from an ascus, and in addition to finding that genetic segregation occurred within the ascus, the possibility presented itself of utilizing the micromanipulator technique in spore crossings and tetrad analysis. By pairing two spores and by observing under the microscope their subsequent copulation, the first artificial yeast hybrids were thus produced. These hybrids (14 interspecific and 1 intergeneric) were purposely produced from parent types which differed in their ability to ferment various sugars in order that the inheritance of the enzymes responsible for fermentation could be investigated; but although the hybrids showed heterosis and sporulated abundantly, their spores unfortunately germinated very poorly, making impossible a detailed genetic analysis of the enzymatic characters involved in this material. An important fact was adduced, however, from these experiments and that was that a hybrid between a fermenter of any particular sugar and a non-fermenter would always be capable of fermenting the sugar, and, in addition, that there was always an excess of fermenters among the few viable spores from such hybrids. Thus the conclusion to be drawn from these results was that in all instances studied, "the ability to synthesize a specific enzyme is dominant in the F_1." Nothing more definite could be stated, and such was the state of our knowledge until 1943, when LINDEGREN began his researches in yeast genetics.

1943—1944

LINDEGREN'S first contribution to the field was an important one — namely, the discovery in 1943 of heterothallism in *Saccharomyces*. By tetrad analysis he was able to show that from each 4-spored ascus 2 spores belong to one mating type and two to another and that therefore mating type specificity is controlled by a single pair of allelomorphs. He also described a phenomenon which he called "illegitimate copulation", in which he maintained that self-diploidization of a single-spore culture invariably leads to poor sporulation and low viability of the ascospores. Although heterothallism in *Saccharomyces* has been confirmed, it is not true that self-diploidized single spore cultures usually sporulate poorly and produce spores with poor germination; we have in our work generally found the opposite to be the case.



Figs. 1—4. WINGE and LAUSTSEN's method for isolating the four spores within one ascus with the aid of a micromanipulator equipped with two glass needles. — (After WINGE & LAUSTSEN, 1937).

Figs. 5—6. Artificial species hybridization in yeasts by the pairing of two ascospores in a nutrient droplet with the aid of a micromanipulator. The smaller spore is from *Saccharomyces validus* and the larger from *S. cerevisiae*. Copulation of the two spores results in a hybrid zygote, the first bud of which is seen in Fig 6. — (After WINGE & LAUSTSEN, 1938).

These investigations of LINDEGREN led, in 1944, to a new method for hybridizing yeasts. Instead of employing the spore crossing technique of WINGE and LAUSTSEN, he simply mixed two haplophase cultures of opposite mating type together in a small amount of nutrient medium, and after a period of incubation to allow for copulation, he transferred the mixture to a sporulating medium. Spores to be used in genetic analyses were then isolated from the asci which arose in this mixture. The advantage of this method over the spore crossing method is, as LINDEGREN justly claimed, the fact that the parents are not "used up" in the crossing and can therefore be employed in further study. On the other hand, the hybrids themselves are not available for analysis unless individual zygotes or their derivatives are isolated from the mixture. A more serious objection to this technique is that self-diploidization of haploid yeasts occurs frequently, so that the so-called hybrids obtained may actually represent the diplophase of one or the other parent.

Employing this new hybridization technique, LINDEGREN and SPIEGELMAN in 1944 were successful in producing hybrids between *S. carlsbergensis* and *S. cerevisiae* which were completely fertile, i. e., a high percentage of the spores were viable, thus making possible for the first time the tetrad analyses of artificially produced yeast hybrids. One of the parents, *S. carlsbergensis,* is able to ferment raffinose completely, while the other parent, *S. cerevisiae,* ferments only 1/3 of it — in other words, *S. carlsbergensis* is capable of fermenting melibiose through the activity of a specific enzyme, while *S. cerevisiae* is not. As was to be expected from the earlier researches of WINGE and LAUSTSEN, the hybrid itself fermented melibiose. Tetrad analyses of the spores from this hybrid yielded segregation ratios which excluded the possibility that only one gene in *S. carlsbergensis* was involved in the production of the enzyme, since in addition to ratios of 2 fermenters : 2 non-fermenters, ratios of 4:0 and 3:1 were also obtained. The conclusion which LINDEGREN and SPIEGELMAN drew from this investigation was that *S. carlsbergensis* contains 2 dominant genes, each of which is able to initiate the synthesis of the enzyme when melibiose is present, and that the other parent, *S. cerevisiae,* contains the two recessive alleles. In other words, this was interpreted as an example of true mendelian inheritance.

SPIEGELMAN and LINDEGREN then turned to a more detailed investigation of the mechanism of enzymatic adaptation in yeasts by comparing this process in haploid and diploid strains of the same species.

A stable, homogeneous diploid was found to adapt to galactose fermentation in the absence of cell division, while genetically unstable haploids were found to adapt only during growth. This was taken to mean that both cytoplasmic interaction as well as mutation and natural selection may be operative in any particular adaptive enzyme system according to the strain employed, and in order to study the biochemistry of enzymatic adaptation, the importance of eliminating natural selection by employing a diploid strain of high genetic stability was stressed.

Thus in the 9 years which had elapsed since the publication of Professor WINGE's first paper on the life cycle of *Saccharomyces* sufficient evidence had accumulated to indicate that inheritance in the yeasts, just as in other organisms, followed classical mendelian laws, and, in addition, that the yeasts were exceedingly promising organisms for future investigations in the field of biochemical genetics. But it was during the years following 1944 that startling and revolutionary hypotheses based upon the yeast genetic work performed in the United States were proposed, which, if they are to be accepted, would mean profound changes in our concept of the gene. It is this work during the period 1945 to 1947 that I would like to discuss now.

1945—1947

SPIEGELMAN and LINDEGREN repeated by means of the mass mating technique the crossing between *S. carlsbergensis,* a melibiose-fermenter, and *S. cerevisiae,* a non-fermenter of melibiose. The strain of *S. carlsbergensis* used in this crossing was now assumed to have only one gene for melibiase production, since 10 asci from the hybrid segregated out regularly as 2 fermenters : 2 non-fermenters. However, when the mating, sporulation, and planting were undertaken in the presence of melibiose, 6 asci gave segregation ratios of 4 fermenters: 0 non-fermenters. When melibiose was removed from the substratum, the 4:0 ratios reverted to the normal 2:2 ratios. However, before the single spore cultures carrying the recessive allele had completely lost their enzyme content in the melibiose-deficient medium, they were re-exposed to melibiose, and it was found that all cultures showed a marked increase in enzymatic activity. The conclusions to be drawn from this experiment were significant. First, it was assumed that the 4:0 ratios resulted from the fact that the 2 normally negative cultures from each ascus were able to ferment due to the transfer of enzyme-

forming factors from the cytoplasm of the hybrid to that of the spores. Secondly, it was assumed that here was an example of the maintenance and synthesis of an enzyme in the complete absence of the gene. These conclusions, of course, were based on the implicit assumption that melibiase production is due to the presence of a dominant gene, the recessive allelomorph of which is unable to initiate the formation of the enzyme. As will be seen later from a discussion of our work on galactose fermentation, another explanation is possible.

In the years 1945 and 1946 there followed a series of papers by LINDEGREN dealing with mendelian and non-mendelian inheritance and with the cytogene theory, proposed to account for the behaviour observed. It is scarcely worthwhile to discuss in detail the experiments upon which the cytogene theory is based, since the theory has later on been completely abandoned by LINDEGREN himself, but a few general remarks concerning it may be of interest. In addition to the experiments I have already discussed, LINDEGREN produced hybrids heterozygous with respect to galactozymase, but instead of the expected 2:2 segregations from the hybrid, 4:0 ratios were obtained. This was interpreted as cytoplasmic transfer — i. e., the adaptive enzyme, or "cytogene" was assumed to be transmitted through the cytoplasm and maintained in cells lacking the dominant gene. Thus the recessive cells were contaminated by the cytogene and continued to ferment as long as the specific substrate was present. Subsequent experimental work by LINDEGREN yielded a large number of irregular segregations which he maintained could not be accounted for in terms of multiple genes, but which, he claimed, gave further support for the cytogene theory. At the Cold Spring Harbor Symposium in 1946 this theory was considerably revised, in that a new phenomenon was considered to be involved — namely, "masked recessiveness". Again, in his genetic analyses, LINDEGREN had obtained a large number of irregular segregation ratios, the majority of which showed an excess of fermenters. One ascus, in particular, derived from a *MmGg* hybrid yielded 4 *M* fermenters and 4 *G* fermenters. This was explained by assuming that the recessive alleles were "masked" by the acquisition at meiosis of the dominant genotype — i. e., *m* becomes *M* and *g* becomes *G*. When such a "masked recessive" was crossed to a normal recessive, 2:2 ratios were obtained, but when it was crossed to a normal dominant, not 4:0, but 2:2 ratios were likewise obtained. A satisfactory and logical explanation of this behaviour appears impossible, and the experimental results seem only to throw doubt upon the validity of

the concept of masked recessiveness. In addition to these theoretical considerations, which, it must be remembered, were primarily based upon the behaviour of one exceptional ascus, LINDEGREN stated that he had repeated the melibiose experiment to which I have already alluded — namely, that maintenance and increase of an adaptive enzyme in the absence of the gene occurs through cytoplasmic transfer from the dominant type. The original results however, could not be duplicated, since just as many 4:0 ratios were obtained this time in the absence of the substrate as were obtained in its presence; this was regarded by LINDEGREN as further evidence for the existence of masked recessives. It is worthy of note that in the discussion following the presentation of this cytogene theory with all of its complexities, LINDEGREN stated in response to a direct question that he would not even consider the multiple factor hypothesis as an explanation for his experimental results, as he deemed it "too elaborate to be justified".

At this same Symposium SPIEGELMAN also discussed, with special reference to yeast investigations, the gene-enzyme problem, wherein he introduced the plasmagene hypothesis. It is important to note, however, that SPIEGELMAN considered that inheritance in yeasts was completely mendelian; his "plasmagenes" were concerned therefore with the mechanism of gene action, rather than with gene transmission. Apparently unaware that LINDEGREN was unable to repeat the now famous experiment involving the apparent synthesis and maintenance of an adaptive enzyme in the absence of the gene, he endeavoured to account for this phenomenon in terms of plasmagenes. His argument was as follows: if 2:2 ratios are normally obtained from a heterozygous hybrid, but 4:0 ratios are obtained in the presence of the specific substrate, then the adaptive enzyme system must be part of a cytoplasmic self-duplicating mechanism, and once the enzyme is formed, its further production can proceed independently of the presence of the gene. In other words, the 2 spores which carry the recessive allele obtain from the cytoplasm of the hybrid replicas of the dominant gene, which he called the plasmagenes. These plasmagenes are self-duplicating and combine with precursor protein and with the substrate to form the enzyme, thus allowing the formation of a specific enzyme to occur within cells which lack the gene normally necessary for its synthesis. The important feature of SPIEGELMAN'S theory is, therefore, that the genes are continually producing nucleo-protein replicas of themselves which pass into the cytoplasm of the cell.

In the ensuing year, 1947, a series of papers by SPIEGELMAN and

his colleagues appeared which dealt with the purely biochemical aspects of enzymatic adaptation. It will suffice to say that they were able to demonstrate the occurrence of competitive interaction between adaptive enzyme systems, a phenomenon which SPIEGELMAN had earlier predicted on the basis of the plasmagene hypothesis, since the different plasmagenes must necessarily compete with one another for protein and energy, and as he termed it, "the outcome determines the enzymatic constitution of the cell".

Meanwhile LINDEGREN had turned from a consideration of the inheritance of the enzymes responsible for the fermentation of carbohydrates to a study of the inheritance of the genes involved in vitamin synthesis. Working with biotin-, pantothenic acid-, para-aminobenzoic acid-, and thiamine-deficient strains, and crossing these with synthesizers, he found for the most part that 2:2 segregations were obtained from the hybrid progeny. In other words, not only was mendelian inheritance operative in the synthesis of vitamins by yeasts, but the ability to synthesize appeared to be controlled in each instance by a single gene. However, further investigations appeared to throw doubt on the simplicity of the phenomenon. In a paper published together with RAUT in 1947, a pantothenate +type was crossed with a pantothenate —type. The hybrid produced was, as expected, capable of synthesizing pantothenate. However, 4 spores from 1 ascus derived from this hybrid were all pantothenate+. This case was explained by the authors as being due to "gene transformation".

Still another complicating factor was introduced into yeast genetics by LINDEGREN in 1947 — namely, "depletion mutations". Since time does not permit a critical discussion of all of LINDEGREN'S theoretical considerations, it will suffice in this case to state that he conceived a depletion mutation as a phenomenon in which a modification is transmitted indefinitely during vegetative reproduction but which is unable to be transmitted through the sexual cycle. According to LINDEGREN, this behaviour, which phenotypically resembles gene mutation, is not due merely to the effect of the environment upon the cytoplasm, but is actually under genetic control.

Thus, to summarize, this period from 1945 to 1947 was characterized by the production by the American investigators of a large number of yeast hybrids, the progeny of which yielded both regular segregation ratios in accordance with classical mendelism, but also irregular, so-called "non-mendelian" ratios. By way of explanation, LINDEGREN proposed his cytogene theory and developed his concepts

of masked recessiveness and depletion mutations. During the same period SPIEGELMAN'S plasmagene theory was proposed in order to account for the maintenance and increase of an adaptive enzyme in the absence of the gene. Now I would like to discuss some of the work on adaptation and the inheritance of enzymatic characters in yeasts which Professor WINGE and I undertook at the Carlsberg Laboratorium, and which first appeared in 1948.

1948

By the spore-crossing technique a hybrid was produced between *S. cerevisiae* and *S. chevalieri* with sufficient fertility to make possible genetic investigations by tetrad analyses. The two parents are distinguished by the fact that *S. cerevisiae* is able to ferment both maltose and galactose, while *S. chevalieri* is unable to do so. Here, then, we had the possibility of determining what type of enzymatic inheritance was operative in this material; our experimental results established incontestably that it was mendelian.

First, with regard to maltose fermentation, our original hybrid yielded the following segregation ratios: 9—4:0 and 3—3:1, which of course excluded the possibility that 1 or 2 genes were involved in the production of maltase. If it is assumed that 3 genes are present, and that 50% crossing over occurs between all three genes and their centromeres, then the theoretically expected ratios would be 52.8% 4:0, 44.4% 3:1, and 2.8% 2:2. Although agreement between the observed and the expected was not close, it nevertheless was indicative of the fact that 3 genes were involved, and in order to test the validity of this hypothesis, we attempted several backcrossings of the single spore progeny of the hybrid to the recessive *S. chevalieri*. Assuming that 3 genes are involved, any spore from the hybrid would contain either 0, 1, 2, or 3 genes, and by crossing the fermenters to the recessive, one should expect to obtain a 1, 2, or 3 gene segregation in the backcross hybrid's progeny. Such indeed was the case. One of our backcross hybrids yielded a typical 1 gene segregation (14—2:2) and two others yielded 2 gene segregations (12—3:1 and 5—2:2; and 4—4:0 and 16—3:1). The conclusion to be drawn from these results is, therefore, that *S. cerevisiae* apparently contains 3 non-linked polymeric genes, M_1, M_2, and M_3, for the production of maltase.

Now, with regard to galactose fermentation, we found at the outset of our experiments that although *S. chevalieri* had been reported to

be incapable of fermenting galactose, it actually was capable of doing so, but only slowly, after a period of adaptation. The tetrad analysis of 12 asci of our original hybrid showed in all cases an unmistakable 2:2 segregation, in that 2 cultures fermented galactose rapidly (1—2 days) and 2 slowly (5—14 days). We assumed therefore that *S. cerevisiae* contained only 1 gene for the production of galactozymase. The tetrad analyses of our backcross hybrids which were heterozygous for galactose fermentation confirmed this assumption. In all cases, a 2:2 segregation was obtained. In the light of the earlier investigations of LINDEGREN and SPIEGELMAN on the mechanism of melibiose adaptation, these findings were of considerable significance. They had implicitly assumed that the recessive allelomorph was incapable of producing the specific enzyme and consequently that when a single ascus from a heterozygous hybrid yielded 4:0 ratios in the presence of the substrate, enzyme synthesis in the absence of the gene must be involved. We, on the other hand, found that in the case of galactozymase, the recessive allelomorph of *G* was not *g*, but g_s which controlled the slow synthesis of the enzyme; in other words, a "long-term adaptation" was involved in the fermentation of galactose by the recessive alleles. Further studies of this long-term adaptation convinced us that it was not result of mutation and natural selection, since we were able to adapt, de-adapt, and re-adapt our g_s types at will, depending upon whether they were grown in a galactose-containing or galactose-deficient medium. We consider, therefore, that long-term adaptation is an expression of the fact that enzyme production in the presence of the sugar is gradually increased until it exists in a sufficiently high concentration to bring about visible fermentation.

1949

The year 1949 brought forth criticism of our views concerning the nature of long-term adaptation, as well as both criticism and confirmation of our views concerning the mendelian nature of the inheritance of enzymatic characters in yeasts.

MUNDKUR and LINDEGREN had reinvestigated the phenomenon of long-term adaptation to galactose fermentation but came to the conclusion that it could be explained entirely on the basis of mutation and natural selection. This explanation was based on the assumption that 3 phenotypes existed: *G*, a rapid fermenter; *g*, a non-fermenter; and g_x a slow fermenter, and that it is through chance mutation from

$g \rightarrow G$ that the phenotypic slow fermenter, g_x, which is actually a mixture of G and g cells, is produced (x signifies the number of days elapsing before fermentation is visible). It is true that our g_s types adapted after varying periods of time and that it would be tempting to conclude that these discrepancies involved chance mutations, but, on the other hand, we had only 2 phenotypes in our material, a rapid and slow fermenter, and had never isolated a spore belonging to MUNDKUR and LINDEGREN's category of "non-fermenters." Another point to bear in mind is that we were unable to de-adapt our G type. If we accept LINDEGREN'S view that long-term adaptation is due to mutation, then the logical consequence would be that in addition to the stable G gene, there also exists an unstable G gene which readily mutates to g. We cannot accept this view of 2 different G genes in *S. cerevisiae* for the synthesis of galactozymase.

Through an investigation of the behaviour of non-synthesizers of thiamine, tryptophane, adenine, and methionine in crosses with synthesizers, POMPER and BURKHOLDER found a 2:2 segregation for each character, demonstrating that only 1 gene was involved in each biosynthesis. With regard to uracil synthesis, non-allelic complementary genes appeared to be involved. The conclusion arrived at by these authors was that "the characters segregated independently and regularly according to mendelian principles."

GILLILAND, using the spore crossing technique, produced a hybrid between *S. italicus* and *S. chevalieri* which was heterozygous in 4 fermentation characters, and he was able to demonstrate conclusively by tetrad analyses that *S. italicus* contains 1 gene for the production of maltase (which has subsequently been identified as M_1) and 1 gene for the production of galactozymase. With regard to raffinose, GILLILAND obtained a 3-gene segregation from 20 asci; these asci gave exactly the same 3 gene segregation for sucrose fermentation, the only difference being that the sucrose recessives, which corresponded to the raffinose negatives, were actually able to ferment sucrose slowly, after adaptation. GILLILAND concluded that *S. chevalieri* apparently contains 3 polymeric genes for the production of β-h-fructosidase, an enzyme capable of hydrolyzing both sucrose and raffinose, but that definite proof of this assertion would have to be obtained from backcrosses to the recessive. An additional observation of interest was that all the raffinose-negative, sucrose-slow cultures were able to ferment maltose, indicating that α-glucosidase may be present in the other parent, *S. italicus*.

It was also in 1949 that LINDEGREN's book, "The Yeast Cell", appeared. I will make no attempt to review this book, which, although containing linkage calculations and the first chromosome maps of the yeasts, deals primarily with much of the material already discussed. I would like to emphasize, however, that in this book LINDEGREN rejects both classical mendelism and his own cytogene theory, and proposes an elaboration of the theory involving the conversion or contamination of alleles to account for inheritance behaviour in yeasts. Since LINDEGREN is apparently convinced that all enzymatic characters in yeasts which have been studied are controlled by single genes, he should obtain only 2:2 segregations in his tetrad analyses of heterozygous hybrids. This, of course, he does not. Therefore the irregular ratios, which for the most part yield an excess of the dominant type, are interpreted as being due to the contamination of the recessive allele by the dominant allele by contact at synapsis during meiosis. Gene conversion is regarded as being controlled by heredity, since it occurs with higher frequency in some lines; thus he would have, for example, a gene influencing the stickiness of the chromosome. I think it is clear that the highly speculative nature of such considerations, interesting as they may be, does not warrant a more detailed discussion. It will suffice to quote LINDEGREN directly in regard to his concept of the gene: "The explanation ... fits all the cases without any fundamental difficulty except that it requires alteration of our apparently well-established views concerning the stability of the gene."

I would like at this time to mention the work of EPHRUSSI and his colleagues which also appeared in 1949 and which dealt for the first time with the inheritance of respiratory enzymes in yeasts. Mutants deficient in cytochrome oxidase and characterized by the production of small colonies were induced through the action of acriflavine. These mutants were employed in extensive crossing experiments with the result that only a very small percentage of them reappeared in the progeny of the hybrids. If the results are to be explained on the basis of multiple genes, EPHRUSSI has calculated that at least 16 dominant genes must be involved. Since this seems highly improbable, it is assumed that the acriflavine-induced mutants have lost self-duplicating cytoplasmic particles which are essential for enzyme synthesis. Accordingly, these first investigations on the inheritance of respiratory enzymes point to the interesting fact that cytoplasmic, rather than mendelian, inheritance is involved.

1950—1951

One of the most interesting of the recent contributions is a paper by SPIEGELMAN, SUSSMAN, & PINSKA dealing with the nature of long-term adaptation in yeasts. It will be recalled that we have explained the phenomenon by assuming that a type containing the recessive allele is a slow synthesizer of the enzyme and that it becomes adapted through a gradual accumulation of enzyme in the presence of the substrate; MUNDKUR and LINDEGREN, however, consider that the phenomenon is due entirely to the occurrence of chance mutations from non-fermenters to fermenters. SPIEGELMAN, on the other hand, considers both explanations inadequate and assumes that long-term adaptation is cytoplasmic in nature. His experimental results indicate that during the period of adaptation, the population of a g_S type actually becomes heterogeneous through production of so-called "positive" cells by the original "negatives". These modifications are not gene mutations; they were found to be induced only by the presence of the substrate, and in its absence, the positive cells were stated to produce negative buds. SPIEGELMAN believes that such a phenomenon can be explained only on a cytoplasmic basis, and furthermore, that it represents additional evidence in support of the plasmagene hypothesis. The theory is admittedly attractive, but similar investigations of adaptive enzyme systems other than galactozymase are necessary to prove its universal validity.

The final contribution I would like to discuss deals with the genes responsible for maltose fermentation. Professor WINGE and I undertook a further study of this problem in order to establish conclusively that polymeric genes are involved in the production of maltase, and that the inheritance of fermentative characters in yeasts is mendelian in nature. This I believe we have done. The work involved the isolation of the 3 *M* genes, as well as a fourth *M* gene, M_4, which arose both spontaneously and as a result of Röntgen irradiation. The identity of these 4 genes was firmly established by extensive hybridization work, involving the artificial production of 81 new hybrids. In all hybrids in which 2 different *M* genes were present, the progeny yielded 2-gene segregations, whereas the progeny of hybrids between types containing the same gene yielded no segregation. In addition to these investigations, work is now in progress on the inheritance of the ability to ferment raffinose and sucrose. It can be stated that we have completely confirmed GILLILAND'S findings with regard to

the existence of 3 polymeric genes for these fermentations, and at present we have already isolated 2 of the 3 genes involved — namely, R_2 and R_3.

Finally, to summarize the developments which have taken place in the field of yeast genetics, it can be said that the work was initiated here in Denmark on the assumption that inheritance in yeasts was mendelian in nature. Subsequent investigations by LINDEGREN demonstrated the occurrence of apparent non-mendelian segregation ratios with regard to fermentation characters and the synthesis of vitamins and amino acids. Accordingly, his concepts of the nature of inheritance in yeasts passed through three distinct phases: first, classical mendelism; second, cytoplasmic inheritance, embodied in the cytogene theory; and finally, his current view of the instability of the gene. It is therefore a matter of considerable interest that the recent investigations of EPHRUSSI have indicated that cytoplasmic as well as mendelian inheritance is involved in the synthesis of respiratory enzymes in yeasts. I think that it is evident, however, that the continuation of the work at the Carlsberg Laboratorium, complicated as it may be by the related problem of enzymatic adaptation, has nevertheless conclusively established that the inheritance of fermentative characters in the yeasts which we have investigated is mendelian and in some cases involves the existence of polymeric genes. Whatever the reasons for the disparity between LINDEGREN'S and our experimental results may be, and the occurrence of self-diploidization, overlapping of generations, and 8-nucleate asci may be mentioned in this connection, the fact remains that we have not obtained segregation ratios in disaccord with MENDEL'S laws. We have no choice, therefore, but to consider the concepts of cytogenes, depletion mutations, masked recessives, and gene conversions to be superfluous, and to regard the inheritance of fermentative characters in yeasts as completely mendelian.

Postscript added January 1956.

Limitation of space precludes more than a brief mention of some of the major contributions to the field made during the past five years.

Interest in the problem of irregular segregation of yeast tetrads has continued unabated, and several different explanations of this phenomenon have been advanced. In 1953 MUNDKUR observed the

localization and movement of mitochondria within the living yeast cell, and knowledge of the localization of enzymes within mitochondria led him to conclude that the random distribution of mitochondria within mother cells and buds could be responsible for vegetative mutants and genetic irregularities. Another explanation, based upon both genetic and cytological evidence, has been found in the occurrence of supernumerary mitoses in the ascogenous cells of yeast monohybrids (WINGE & ROBERTS 1954). If the normal number of 4 nuclei in the immature ascus is increased to 8 with consequent duplication of the genotypes, and if some of the nuclei (or spores) do not survive, then it can be a matter of chance which genotypes the surviving spores contain. In addition, these extra mitoses may lead to the formation of binucleate heterozygous or homozygous spores, and examples of irregular segregation in LINDEGREN'S haploid material revealed that one of the 4 single-spore cultures in each of 3 irregular tetrads was diploid and heterozygous. Still another explanation — and one which enjoys many adherents — involves the occurrence of polyploidy in yeasts. It is obvious that polyploid inheritance in a yeast would result in segregations quite different from the 2:2 expected from a monohybrid, and claims of its existence were set forth in 1951 by LINDEGREN & LINDEGREN and by ROMAN, HAWTHORNE, & DOUGLAS. In 1954 further evidence for polyploid segregation was presented by POMPER & MCKEE and by LEUPOLD & HOTTINGUER, while a still more detailed study by ROMAN, PHILLIPS, & SANDS appeared the following year. It should be noted that these investigators all worked with haploid material, whose single spore progeny could, as a rare event, diploidize, and by mixing such a clone with another haploid or diploid of opposite mating type, triploids or tetraploids were obtained in small numbers. Diploid material, on the other hand, contains the *D*-gene which brings about diploidization whenever present and also appears to abolish the expression of mating type. The fusion of diploid cells to form tetraploids or the fusion of a diploid and a haploid cell has not been found in this material.

Another important advance has been the demonstration of the existence of complementary genes in the inheritance of fermentative characters in yeasts. LEUPOLD & HOTTINGUER (1954), working on galactose fermentation, obtained segregation ratios which led them to conclude that 2 complementary genes were involved in the fermentation of this monosaccharide. The elegant investigations of GILLILAND (1954) on *Saccharomyces diastaticus* have elucidated the genetics of

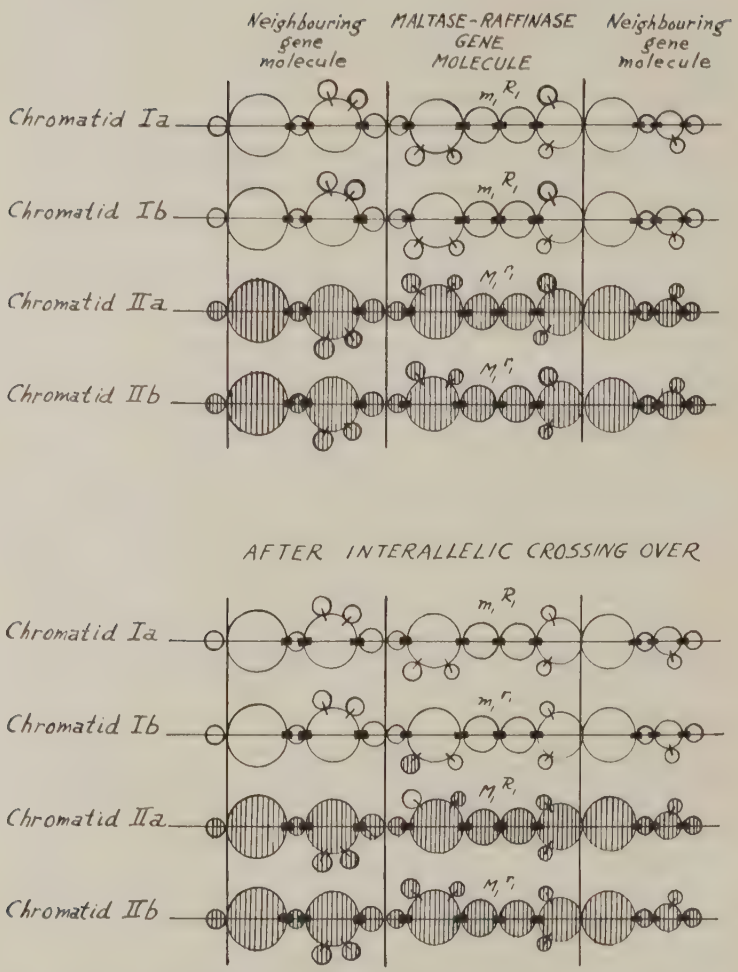


Fig. 7. Diagram illustrating WINGE'S hypothesis of interallelic crossing over at the 4-strand stage in the complex maltase-raffinase gene molecule in *Saccharomyces*. Chromatid Ib and Chromatid IIa exchange molecular groups, resulting in two new genes, $m_1 r_1$ and $M_1 R_1$. The molecular groups (represented as circles) are bound together by thick or thin lines, indicating the relative strength of the bond. — (After WINGE, 1955).

super-attenuation, or dextrin fermentation, which is of practical significance in brewing and, at the same time, have demonstrated the occurrence of complementary genes in this material. He isolated the gene *S*, which produces amylase, responsible for the hydrolysis of dextrin to maltose, M_1, which is responsible for the rapid fermentation of maltose, and a new *M*-gene, M_5, which is responsible for the slow fermentation of maltose. For super-attenuation to occur, therefore, the presence of both *S* and an *M*-gene is required. Finally, with regard to complementary gene action, it has been demonstrated (WINGE & ROBERTS 1956) that raffinose fermentation may be brought about not only by the *R*-genes responsible for the synthesis of *β*-h-fructosidase which hydrolyzes the raffinose molecule into melibiose and fructose, but also by the combined action of the melibiase gene, *Me*, and the galactozymase gene, *G*. It was demonstrated that melibiase alone is able to hydrolyze the raffinose molecule into sucrose and galactose, but if galactozymase is also present, then the galactose portion is fermented away, resulting in a 1/3 fermentation of the raffinose molecule.

Finally, mention should be made of the significant contribution of WINGE (1955) in the form of a new hypothesis termed interallelic crossing-over, an hypothesis which was not evolved in order to account for irregular segregation but to account for the occurrence in yeasts of extremely close linkage between two pairs of fermentative genes (M_1-R_1 and M_3-R_3) which could not reasonably be credited to chance. While not denying the validity of mendelian law, this hypothesis regards these two linked genes actually as one complex gene molecule, whose individual molecular groups may undergo interallelic crossing-over. It differs essentially from the conversion hypothesis of WINKLER and of LINDEGREN in that the result of this new type of crossing-over is not the transformation of a dominant or a recessive into its allelomorph, but the creation of two *new* allelomorphs, and it is significant that one of its fundamental assumptions is that the enzymes synthesized by these closely-linked genes are probably chemically similar, since the difference between them does not exceed more than a portion of the whole molecular complex.

LITERATURE

Ephrussi, Boris: Nucleo-cytoplasmic relations in micro-organisms. — Oxford University Press, 1953.

Gilliland, R. B.: A yeast hybrid heterozygotic in four fermentation characters. — Compt. Rend. d. Lab. Carlsberg, Sér. Physiol. 24: 347—356. 1949.

— : A study of a wild yeast — Saccharomyces diastaticus. — Wallerstein Lab. Comm. 17: 165—175. 1954.

Leupold, Urs & Hottinguer, Hélène: Some data on segregation in Saccharomyces. — Heredity 8: 243—258. 1954.

Lindegren, Carl C. & Lindegren, Gertrude: Selecting, inbreeding, recombining, and hybridizing commercial yeasts. — Journ. Bact. 46: 405—419. 1943.

— : A new method for hybridizing yeast. — Natl. Acad. Sci. Proc. 29: 306—308. 1943.

Lindegren, Carl C., Spiegelman, S., & Lindegren, Gertrude: Mendelian inheritance of adaptive enzymes in yeast. — Natl. Acad. Sci. Proc. 30: 346—352. 1944.

Lindegren, Carl C. & Lindegren, Gertrude: The cytogene theory. — Cold Spring Harbor Symposia Quant. Biol. 11: 115—129. 1946.

— : Depletion mutation in Saccharomyces. — Natl. Acad. Sci. Proc. 33: 314—318. 1947.

— : Tetraploid Saccharomyces. — Journ. Gen. Microb. 5: 885—893. 1951.

— : Proximity of genes controlling the fermentation of similar carbohydrates in Saccharomyces. — Nature 170: 965—968. 1952.

— **Carl C.:** Concepts of gene-structure and gene-action derived from tetrad analysis of Saccharomyces. — Experientia 9: 75—80. 1953.

— **Carl C. & Lindegren, Gertrude:** Asci in Saccharomyces with more than four spores. — Genetics 38: 73—78. 1953.

Mundkur, Balaji D. & Lindegren, C. C.: An analysis of the phenomenon of long-term adaptation to galactose by Saccharomyces. — Amer. Jour. Bot. 36: 722—727. 1949.

— **B. D.:** Mitochondrial distribution in Saccharomyces. — Nature 171: 793—794. 1953.

Pomper, Seymour & Burkholder, P. R.: Studies on the biochemical genetics of yeast. — Nat. Acad. Sci. Proc. 35: 456—464. 1949.

— **S., Daniels, K. M. & McKee, D. W.:** Genetic analysis of polyploid yeast. — Genetics 39: 343—355. 1954.

Roman, Herschel, Hawthorne, Douglas C., & Douglas, Howard C.: Polyploidy in yeast and its bearing on the occurrence of irregular genetic ratios. — Natl. Acad. Sci. Proc. 37: 79—84. 1951.

— **Phillips, Marcia M., & Sands, Stanley M.:** Studies of polyploid Saccharomyces. I. Tetraploid segregation. — Genetics 40: 546—561. 1955.

Spiegelman, S., Lindegren, Carl C., & Lindegren, Gertrude: Maintenance and increase of a genetic character by a substrate-cytoplasmic interaction in the absence of the specific gene. — Natl. Acad. Sci. Proc. 31: 95—102. 1945.

Spiegelman, S., Sussman, Racquel Rotman, & Pinska, E.: On the cytoplasmic nature of "long-term adaptation" in yeast. — Natl. Acad. Sci. Proc. 36: 591—606. 1950.

Winge, Ö.: On haplophase and diplophase in some Saccharomycetes. — Compt. Rend. d. Lab. Carlsberg, Sér. Physiol. 21: 77—111. 1935.

— **& Laustsen, O.:** On two types of spore germination, and on genetic segregations in Saccharomyces, demonstrated through single-spore cultures. — Ibid. 22: 99—116. 1937.

— **& Laustsen, O.:** Artificial species hybridization in yeast. — Ibid. 22: 235—244. 1938.

— **& Laustsen, O.:** On 14 new yeast types, produced by hybridization. — Ibid. 22: 337—352. 1939.

— **& Roberts, Catherine:** Inheritance of enzymatic characters in yeasts, and the phenomenon of long-term adaptation. — Ibid. 24: 263—315. 1948.

— **& Roberts, Catherine:** The polymeric genes for maltose fermentation in yeasts, and their mutability. — Ibid. 25: 35—83. 1950.

— **& Roberts, Catherine:** Non-mendelian segregation from heterozygotic yeast asci. — Nature 165: 157. 1950.

— **& Roberts, Catherine:** Causes of deviations from 2:2 segregations in the tetrads of monohybrid yeasts. — Compt. Rend. d. Lab. Carlsberg, Sér. Physiol. 25: 285—329. 1954.

— **:** On interallelic crossing over. — Ibid. 25: 341—354. 1955.

— **& Roberts, Catherine:** Complementary action of melibiase and galactozymase on raffinose fermentation. — Nature 177: 383—384. 1956.

Copenhagen, January 1956.

THREE RARE OR LITTLE KNOWN BOLETS IN SWEDEN

BOLETUS PULVERULENTUS Opat., B. RADICANS Pers. ex Fr. AND PHYLLOPORUS RHODOXANTHUS (Schw.) Bres.

By OLOF ANDERSSON

More than ten years ago the present writer (Andersson 1943) published a paper on some bolets, a paper, which was more in the nature of a preliminary report. Through the present writer's own studies of the larger fungi of the southern deciduous woods in Sweden in 1943—55 and other persons' investigations our knowledge of the distribution and ecology of the bolets in question has been considerably widened. To this can be added other species which previously have been little or not at all known in Sweden. The present paper deals with three of these species, *B. pulverulentus, B. radicans* and *Phylloporus rhodoxanthus.*

1. Boletus pulverulentus Opat.

Syn.: *B. radicans* Fr. 1836-1838 p. p. (non Pers., non Kbch.). — *B. radicans* ss Bres. 1931. — *Ceriomyces cyaneitinctus* Murr. 1943. — *B. cyaneitinctus* id. — *Xerocomus pulverulentus* (Opat.) Gilb. 1931.

P i l e u s first adpressed with the margin to the stipe, more or less hemispherical, then pulvinate, convex-applanate, often with depressed middle and undulated; margin incurved, then sharp, with a somewhat exceeding cuticle, 3.5—10.5 cm, minutely tomentose, dry, somewhat viscid when wet, at last subglabrous, yellow-milky coffee*

*) The quotation marks about the colours refer to Ridgway's Color Standards and Color Nomenclature, 1912.

("Buckthorn Brown", "Brussels Brown"), often with an olivaceous ("Tawny Olive") and paler reddish tinge ("Morocco Red"), as older darker ("Auburn", "Reeds Brown"), on pressure immediately dark brown; cuticle not separable.

Tubes adnate to adnate sinuate, the walls of the tubes decurrent with a tooth on the stem, 0.5 to 2 cm long, yellow, lemon gold ("Strontium Yellow") with a tinge of olive, on injury becoming instantly very blue.

Pores roundish to angular, in age edged and denticulate, lemon to gold, then pale greenish, at last rusty brown, immediately turning dark blue at touch.

Stipe 3.5—6 × 1—1.5 cm (sometimes broader at apex, to 3.5 cm), variable in stature, but mostly cylindraceous, at the base curved and radicating, dry, velutinous punctate, at the apex gold, red brown to dark brown at the base.

Context soft, gummous, citrin to gold, under the cuticle brownish to reddish, instantly turning blue when cut, in the stem dark purple below.

Spores yellow, ellipsoid to fusiform, 10—12—14 (—16) × 4.5—5 (—6) μ.

Cystidia clavate, fusiform, 40—75 × (5)—9—12 μ.

Taxonomic Remarks. Owing to the strong inconstancy in colour in young and old stages the determination of *B. pulverulentus* often meets with difficulties. It is primarily characterized by the coarse, first yellow, mild context, immediately turning blue on injury and all parts being dark to almost black on pressure.

The specimens found by the present writer remind us mainly of those described by Skovsted (1940—41) from Denmark. They agree best with Bresadola's figure in Icon. myc. (1931, vol. XIX, plate 916, sub nom. *radicans)* and with Usak's excellent picture (Česká mykologie 1953, plate 11), but not with Konrad & Maublanc's figures (1924—37) which are too dark. Older stages have a strong likeness to Opatowski's (1836) original picture.

History. As regards the general historical survey of the species cf. Kallenbach (1927, pag. 15—16).

B. pulverulentus seems to be first reported from Sweden sub nom. *B. radicans* Pers. by Fries (1836—38): "In quercetis (Näset ad Odensjö)". Although he refers to Persoon (1801), it is evident from some parts of his description that he was not describing *B. radicans* sensu Pers. (see below) but *B. pulverulentus:* ". . . . stipite

attenuato-radicato laevi flavo e pruina rubente flocculoso, tactu nudo obscurato, tubulis adnatis amplis inaequalibus citrinis. ..... odor et sapor ingratus. Caro flava, illico obscure caerulescit." These statements which are in agreement with OPATOWSKI's diagnosis (l. c.), must be based on FRIES' own observations, because he as it seems had no access to OPATOWSKI's thesis, when he wrote his diagnosis. First in Summa Veg. (1849) does he adopt *B. pulverulentus* as a synonym and records the species from Västergötland, too, where it was found by LINDGREN (1845). In Hym. Eur. (1874) he still uses the name *B. radicans* but states "Sapor amaricans". This statement must be influenced by PERSOON's diagnosis.

The species was, then, not mentioned in Swedish literature before INGELSTRÖM (1940), but he does not communicate any stations. At present there are 13 localities known from Sweden.

In Denmark it was discovered in 1924, but this find was not communicated before 1940 by CHRISTIANSEN (Friesia 1940—41). Earlier, however, it had been mentioned in excursion records from 1933 and 1934 (Friesia 1934, 1936). Now 14 Danish localities are stated.

MALMSTRÖM's (1943) statement from Finland is due to a misinterpretation (MALMSTRÖM in litt. 30.4.1955). From Norway no records.

N o r d i c D i s t r i b u t i o n. *B. pulverulentus* is a species, which reaches its northern limit in the southernmost Nordic.

Denmark

F y n. District 29 — "Røverskov", 17.8.32 (SKOVSTED l. c.). — Langesø Skov, J. LANGE (SKOVSTED l. c.). D. 28 — Nørre-Søby st. (SKOVSTED l. c.).

S j æ l l a n d. D. 39 — Vintersbølle Skov, 21.9.41 (Friesia 2, p. 280). D. 40 — Jægersborg Dyrehave, 23.9.45 (Friesia 3, p. 232). — Bregentved, 10.9.33 (Friesia 1, p. 196). — Charlottenlund Slotspark, 9.8.36 (CHRISTIANSEN l. c.). — Hæsede Skov, 4.10.36 (Friesia 2, p. 126). — Køge Aas, 20.9.24 (CHRISTIANSEN l. c.). — Næsbyholm, 16.9.34 (Friesia 1, p. 322). — Vallø Dyrehave, 1.8.36 (CHRISTIANSEN l. c.). D. 45 a — Ganløse Ore, 30.8.36 (Friesia 2, p. 123). — Gelskov, 9.10.38 (Friesia 2, p. 192). D. 45 b — Lille Dyrehave at Hillerød (Friesia 2, p. 124).

Sweden

S k å n e. Bjäresjö, Bjäresjöholm, 27.8.52. — Fågeltofta, Kronovall, 13.8.52. — Gladsax, Örnaberga, 29.8.54. — Lövestad, "Lövestads åsar", 24.8.54. — Rörum, Stråntemölla, 30.8.54. — Skepparslöv, Käl-

lunda, 26.8.53. — Smedstorp, Listarum, 14.9.54. — S. Mellby, Stenshuvud, 30.9.49. — Tosterup, near the church, 7.9.52. — Träne, Ovesholm, 17.9.55. — Ö. Sönnarslöv, Maltesholm, 2.10.52.

Småland. Odensjö, ad Näset (Fries l. c.).

Västergötland. Rackeby (Lindgren l. c.).

Extra-Nordic Distribution. The species has a circumpolar distribution in the northern hemisphere with a southern tendency. In Europe it is known from Austria, Czechoslovakia, England, France, Germany, Italy, Luxemburg, Switzerland (Kallenbach l. c.), Poland (Skirgiello 1939) and Russia / Caucasia / (Singer 1947). Murrill (l. c.) and Singer (l. c.) report it from North America.

Environmental Conditions. In the Nordic *B. pulverulentus* occurs in deciduous woods, especially those of beech and hornbeam both in the *Allietum*—ass. and the *Galietum*—ass., communities, corresponding to the *Allietum*—union resp. *Galietum* union, described by Håkansson (1949, in MS).

A few words will be said about the constitution of these communities which compose the field-layer especially in the beech woods in southernmost Sweden. The *Allietum*—ass. occurs in clayey, calcareous moraine, alum slate moraine and sometimes in sandy soil, where the inclination of the ground favours the oozing out of the subsoil-water, while the *Galietum*—ass. is correlated with more or less sandy soil. In the latter association *Galium odoratum* is dominating often with a subdominance of *Oxalis acetosella*. The vernal aspect is characterized by *Anemone nemorosa*. The *Galietum*—ass. is richer in fungi than the *Allietum*—ass. In spring *Allium ursinum* and *Anemone nemorosa* are dominating in the *Allietum*—ass., the *Allium ursinum*—soc. of which in summer is characterized by a few species with a low degree of cover.

Outside the Nordic *B. pulverulentus* occurs in mixed woods but with partiality for beech woods in Europe. Also in North America it prefers deciduous trees. Singer (l. c.) states: "In high and mesophytic hammocks and in gardens, on lawns, farther north and in the mountains usually in mixed frondose woods or under shrubs near *Fagales* (in Florida *Quercus laurifolia*, and possibly other species of oak, maybe also hickory) on grassy, mostly sandy and argillaceous soil."

2. Boletus radicans Pers. ex Fr. sensu Kbch.

Syn.: *B. candicans* Inzenga (ex Fr.) 1869. — *Boletus albidus* ss Konrad 1929, non Roques 1841. — *B. albidus* ssp. *eupachypus* Konr. 1929.

Pileus thick, hemispherical, then convex, with long incurved, uneven margin, 7—15—20 cm, tomentose, then smooth, somewhat silky shining, dingy white-grey, pale milky coffee, in age often shamoy ("Isabella Color").

Tubes first pale yellow, soon lemon yellow, being bluish at touch, adnexed, up to 3 cm long.

Pores citrin yellowish ("Reed Yellow") with a pale greenish tinge, olive brownish, on injury and at touch blue, small, roundish-angular.

Stipe 4—10×3—6 cm, ovate to bulbous, in age often elongated, radicating, tomentose to smooth, pale yellow ("Primrose Yellow"), more vivid at the apex, with a concolorous net of fine meshes, which are larger against the middle, and an olivaceous tinge below, often brownish to reddish, being blue at touch.

Context very firm and hard, in age softer, in the cap pale lemon yellow, at the apex of the tubes a more vivid yellow, under the cuticle somewhat greyish brownish, in the stem olive yellow above, olive brown below, turning blue on injury, then fading.

Spores subfusoid, 10—12—14×4.5—5—6 μ.

Cystidia conical fusiform, hyalin to yellow, 30—60×5—11 μ.

History. The interpretations of this species have been very difficult and various. As pointed out above (pag. 181), it has been confused with *B. pulverulentus*. It was first described by Persoon (1801) and then adopted by Fries in Syst. Myc. (1821).

That by Roques (1841, 3 ed., 1864) described and pictured *B. albidus* which by some authors, Konrad (l. c.), Konrad & Maublanc (1952) and Kühner & Romagnesi (1953), has been regarded as identical, does not belong here. According to Roques (l. c.) the context of his *albidus* has a white colour and a sweet taste, while *B. radicans* has a pale yellow to lemon context with a bitter taste. *B. albidus* sensu Konrad (l. c.) and *B. albidus* ssp. *eupachypus* Konrad (l. c.) are both identical with *B. radicans*.

B. radicans was first reported from Sweden by Kallenbach (l. c.) but sine loco. His statement is based on an acceptable picture of the species by Romell, who calls it *B. flavipes* ad. int. It was next found by G. Lyttkens in Gotland in 1946. At the present time it has been

collected in 13 stations. MØLLER (1940) first communicated it from Denmark, where it now has been stated from 18 localities. No records from Finland or Norway.

Nordic Distribution. The species is limited to the southern provinces, where it often grows in districts with limestone or loose calcareous layers.

Denmark

Nørrejylland. District 21 — Aarhus (MØLLER l. c.).

Sønderjylland. D. 53 — Als Nørreskov, Taksensand, 21.8.48 (F. TERKELSEN). — Løjt Sønderskov, 31.7.53 (F. TERKELSEN).

Lolland. D. 35 — Christianssæde (MØLLER l. c.). — Pederstrup (MØLLER l. c.). — Sæbyholm Skov at Nakskov (JENSEN). — Ryde Skov, 30.8.25 (MØLLER). — Ludvigshave, 20.8.20 (MØLLER). — Eriksvolde at Skåningshave, 16.8.24 (MØLLER). — D. 36 — Gl. Fredskov, 19.8.34 (MØLLER). — Knuthenborg Park, 15.8.37 (MØLLER). — Ålholm Park, 11.9.37 (MØLLER).

Falster. D. 37 — Ourupgaard Park (MØLLER l. c.) — Korselitzeskovene (MØLLER l. c.).

Møen. D. 38 — Klinteskoven (JENSEN); 14.9.47 (Friesia 3, p. 446).

Sjælland. D. 39 a — Langebæk Skov (JENSEN). — D. 40. — Vallø Slotspark at Køge (JENSEN). — Marielyst Skov at Vordingborg, 5.8.21 (MØLLER).

Sweden

Skåne. Lund, Botanical Garden, amongst grass, on very hard soil, under beech, 30.9.50.

Östergötland. V. Tollstad, Höje, meadow with oak, 3.9.51 (G. HAGLUND).

Uppland. Djurö, Runmarö, Vånö brygga, 26.8.51 (G. HAGLUND); Södersunda, about 150 m E of the church, under oak, 10.9.50 (R. RYDBERG). — Ljusterö, Kalvholmen, Siarö, under oak and hazel, 19.8.51 (OLLE PERSSON). — Lovö, Drottningholm, under oak, 25.5.51 (G. HAGLUND); 30.8.51 (MAJA ENGLUND). — Österåker, Fåglarö, Fåglarö brygga, 6.9.52 (OLLE PERSSON).

Gotland. Buttle, N of Änge, 30.8.48 (BENGT PETTERSSON). — Endre, Allekvie, on hard clayey soil, under oak, 15.9.53; Svenskens, 17.8.46 (G. LYTTKENS); 26.8.46 (BENGT PETTERSSON); 30.8.46 (E. TH. FRIES). — Eskelhem, Ekebys, 28.9.47 (GÖSTA and ESTER LÖFVEBERG). Källunge, at the railway stn, 26.8.47 (E. TH. FRIES). — Västerhejde, Stenstu (E. TH. FRIES).

Extra-Nordic Distribution. The area lies within the limits of the deciduous woods in Europe. Within this area it is recorded from Austria, England, France, Germany, Italy, Poland, Switzerland, Russia (Latvia) and Yugoslavia. KALLENBACH (l. c.) reports it from North Africa, too. Also found by SINGER (l. c.) in Maine, U. S. A.

Environmental Conditions. Owing to the fact that the species is rare, it is very difficult to get a general idea about its ecology. The finds hitherto made, however, indicate that it prefers light and dry woods and park meadows on hard lime rich soil.

The small number of statements from other parts of Europe point in the same direction. Thus KALLENBACH (l. c.) states deciduous woods, even wood meadows, under oak and beech. In southern Europe it is known from oak woods and in North Africa under *Quercus Suber*.

3. Phylloporus rhodoxanthus (SCHW.) BRES.

Syn.: *Agaricus rhodoxanthus* SCHW. 1822. — *Agaricus Pelletieri* LÉV. apud CROUAN et CROUAN 1867. — *Agaricus paradoxus* KALCHBR. 1873. — *Clitocybe Pelletieri* GILL. 1878. — *Gomphidius rhodoxanthus* SACC. 1887. — *Paxillus Pelletieri* VEL. 1920.

Pileus first pulvinate, then convex, with a somewhat uneven recurved margin, velutinous, 4.5—8 cm, reddish brown ("Auburn", "Burnels Brown").

Gills broad, rather distant, anastomosing, decurrent with ribs on the stipe, golden ("Lemon Chrome", "Aniline Yellow"), on injury reddish or fulvous.

Stipe 4—5×1.2—1.5 cm, tapering and somewhat curved at the base, yellow, with a tinge of rufous, fibrillose-striate and squamulose at the apex.

Context pale yellow, under the cuticle somewhat reddish.

Spores ellipsoidic, 11—14×3.5—5μ.

Cystidia fusoid, 45—70×5.5—10μ, yellowish-brownish.

Taxonomic Remarks. *P. rhodoxanthus* has been placed both in *Boletaceae* and *Agaricaceae*. Its natural position is in *Boletaceae*, which is indicated by the velutinous pileus, the spore shape and the characteristic chemical reaction of the pileus surface by a deep blue colour on ammonia. The latter character has not been found in any gill fungus (SINGER l. c.).

It is a rather variable species. SINGER (l. c.) has erected 4 subspecies, which he distinguishes with regard to morphological differences and different areas of distribution in ssp. *europaeus, americanus, bogoriensis* and *foliiporus*. Of these *foliiporus* and *bogoriensis* have been described as species before. SINGER's interpretation seems to be right as regards the differentiating between *foliiporus* and *bogoriensis* and these against *europaeus* and *americanus*. From SINGER's descriptions it seems to the present writer that no marked morphological differences actually exist between these last mentioned taxa. They might be brought together into one taxon with the rank of a subspecies, in the present paper called the main type.

History. The species was described by SCHWEINITZ (1822). It is uncertain if *Agaricus Tammii* ss FRIES, which by some authors (i. e. KONRAD & MAUBLANC 1924—37) is regarded as synonymous to *P. rhodoxanthus,* can belong here. Neither FRIES' description nor illustration of *A. Tammii* in Icon. sel. Hym. (1877) can motive such a presumption. His diagnosis lacks some important characters, i. e. the broad anastomosing gills and the velutinous pileus. But PATOUILLARD's picture of *A. Tammii* (1885) is identical with the main type of *P. rhodoxanthus*.

The first Swedish locality is recorded by INGELSTRÖM (l. c.). At the present time it is known from 8 stations. And in Denmark it is found in 7 localities. No records from Norway and Finland.

Nordic Distribution. *P. rhodoxanthus* (the main type) is restricted to the southern parts of the Nordic and occurs mainly within the beech region. Its northernmost station is Stockholm (?).

Denmark

Fyn. D. 32 — "Egeskov" at Kværndrup (JENSEN).

Lolland. D. 36 — Grænge skov (MØLLER). — Fuglsang Storskov (JENSEN).

Sjælland. D. 39 a — Vintersbølle skov at Vordingborg (JENSEN). — D. 40 — Skjoldnæsholm skov (JENSEN). — D. 45 a Jægersborg Dyrehave (JENSEN. — D. 45 b — Grib skov, 20.9.53 (Friesia 5, p. 126).

Sweden

Skåne. Börringe, Börringekloster, 2.9.45. — Genarp, Häckeberga, 18.8.45. — Hyby, Bökebergsslätt, 2.9.45. — Lövestad, "Lövestads åsar", 23.9.54. — Ravlunda, Brostorp, 26.8.51. — S. Mellby, Stenshuvud, 25.8.53. — Tolånga, Anklam, 1950—51.

Stockholm. Djurgården (INGELSTRÖM l. c.).

Extra-Nordic Distribution. The main type of *P. rhodoxanthus* has a large area of distribution, which includes parts of temperate North America, Europe, the Far Eastern Provinces of the U.S.S.R., Eastern China, Japan (and French Indo-China ?).

The subspecies *foliiporus* has a small area in southernmost North America (Florida), and *bogoriensis* is a tropical subspecies, distributed in Java (and the Malay Peninsula ?).

Environmental Conditions. With regard to the few finds it is very difficult to draw any general conclusions about the ecology of the species. It is found both in beech woods and mixed deciduous woods without beech, where it mainly grows in the *Galietum* — ass., but also in the *Allietum* — ass. The substratum is fine mull or coarse mull on siliceous and calcareous sand, primary rock and alum slate moraine.

REFERENCES

Andersson, C. (1943): Studier över Boletacéer. — Bot. Not. Lund.

Bresadola, J. (1931): Iconographia Mycologica. Vol. XIX. — Mediolani.

Christiansen, M. P. (1940—41): Boletus pulverulentus Opat. — Friesia 2. København.

Crouan, P. L. et H. M. (1867): Florule de Finistère. — Paris.

Fries, E. (1821): Systema mycologicum. Vol. I. — Lundae.

— (1836—38): Epicrisis systematis mycologici. — Upsaliae.

— (1849): Summa vegetabilium Scandinaviae. Bd. 2. — Upsaliae.

— (1861): Hymenomycetes novi vel minus cogniti, in Suecia 1852—60 observati. — Öfvers. K. Vet.-Akad. Förh. Stockholm.

— (1867—84): Icones selectae Hymenomycetum nondum delineatorum.

— (1874): Hymenomycetes Europaei. — Upsaliae.

Gilbert, E. J. (1931): Les Bolets. — Les Livres du Mycologie. Paris.

Gillet, C. C. (1874—79): Les Hyménomycètes. — Alençon.

Hertz, V. (1940—41): Boletus pulverulentus i Charlottenlund Skov. — Friesia 2. København.

Håkansson, T. (1949): Studier över bokskogen och dess växtsamhällan på Söderåsen samt dessas ställning inom skånsk lövskogsvegetation. (in MS).

Ingelström, E. (1940): Svampflora. — Stockholm.

Inzenga, G. (1869): Funghi siciliani. Cent. sec. — Palermo.

Jensen, J. P.: Topografisk oversigt over publicerede fund i årene 1900—1950 efter Botanisk Tidsskrift, Dansk Botanisk Arkiv, etc. (not printed).

Kalchbrenner, C. (1873): Icones selectae Hymenomycetum Hungariae I. — Pestini.

Kallenbach, J. (1926—38): Die Röhrlinge in „Die Pilze Mitteleuropas". — Leipzig.

Kern, Hs. (1945): Die Röhrlinge. — Olten.

Konrad, P. (1929): Notes critiques sur quelques champignons du Jura. — Bull. Soc. Myc. Fr. Tome XLV. Paris.

— et **Maublanc, A.** (1924—37): Icones selectae Fungorum. Tome I—VI. — Paris.

— — (1952): Les Agaricales. — Encycl. Myc. XX. Paris.

Kühner, R. et Romagnesi, H. (1953): Flore analytique des champignons supérieurs (Agarics, Bolets, Chantarelles). — Paris.

Lindgren, S. J. (1845): Notiser från Wenern. — Bot. Not. Lund.

Malmström, N. (1943): Boletus pulverulentus Opat. och B. castaneus Bull., nya för Finland. — Mem. Soc. Fauna et Flora Fenn. 18. 1941—42. Helsingforsiae.

Møller, F. H. (1940): Svampeekskursion til Petersgaard-Skovene ved Kalvehave den 17.9.39. — Flora og Fauna. 46. Aarg. Aarhus.

Murrill, W. A. (1943): More New Fungi from Florida. — Lloydia. Cincinnati. Ohio.

Opatowski, G. (1836): De familia fungorum Boletoideorum. — Arch. Naturgesch. von Fr. Aug. Wiegmann Zweit. Jahrg. Berlin.

Patouillard, N. (1885): Tabulae analyticae Fungorum. Fasc. IV. — Paris.

Pearson, A. A. (1950): British Boleti. — The Naturalist. Leeds.

Persoon, D. C. H. (1801): Synopsis Methodica Fungorum. Pars I. — Gottingae.

Pilát, A. (1953): Suchobřib modračka — Xerocomus pulverulentus (Opat.) Gilb. — Česká myk. VII.

Ridgway, R. (1912): Color Standards and Color Nomenclature. — Washington, D. C.

Roques, J. (1864): Histoire de Champignons comestibles et vénéneux. 3 ed. — Paris.

Saccardo, P. A. (1887—1912): Sylloge fungorum.

Schweinitz, L. D. (1822): Synopsis fungorum Carolinae superioris. — Schr. Naturf. Ges. Leipzig.

Singer, R. (1938): Sur les genres Ixocomus, Boletinus, Phylloporus, Gyrodon et Gomphidius. — Rev. Myc., N. S. Paris.

— (1945—47): The Boletineae of Florida with notes on extralimital species. — Reprinted from Farlowia 1945—46 and The Amer. Midlands Nat. 1947.

Skirgiello, Alina. (1939): Polskie naziemme grzyby rurkowe (Boletaceae et partim Polyporaceae terrestres Poloniae). — Planta Pol. Vol. VIII. Warszawa.

Skovsted, A. P. (1940—41): Boletus pulverulentus (Opat.) En ny Rørhat for Danmark. — Friesia 2. København.

Velenovský, J. (1920): České Houby. Díl. II. — V Praze.

Stockholm, March 1956.

THE NITROGEN REQUIREMENTS OF COPRINUS HEPTEMERUS M. LANGE & SMITH

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Coprophilous species of the genus *Coprinus* have now been used for experimental work for nearly a century. Almost all investigators have used either natural media e. g. sterilised horse dung or semisynthetic media as KAUFFMAN's horse dung agar or potato-glucose agar.

LEONIAN & LILLY (1938) were the first to grow a *Coprinus* on a truely synthetic medium. They studied the growth of *Coprinus lagopus* (i. e. C. *fimetarius* (L.) ex FR.) and 24 other fungi, combining thiamine with several nitrogen sources. KEYWORTH (1942) obtained fruit bodies of *Coprinus ephemerus* on a synthetic medium. LISBETH FRIES (1945) showed thiamine-deficiency of eight species of *Coprinus* and the effects of pH on their growth. Later she studied the requirements of *Coprinus fimetarius* under high temperature conditions (L. FRIES 1953).

I have obtained normal and regular fructification of *Coprinus sassii* M. LANGE & SMITH, *C. congregatus* FR., *C. heptemerus* M. LANGE & SMITH (BILLE-HANSEN 1953 a, b) and *C. bisporus* J. LANGE and *C. plagioporus* Romagnesi (unpublished data) — all on the same synthetic medium.

It has not been possible to reproduce the positive results obtained with *C. heptemerus* (1953 b). The error is probably due to the unnoticed presence of small fruit body primordia on the bits of mycelia used for inoculation. — The four other species, viz. *Coprinus bisporus, C. congregatus, C. plagioporus* and *C. sassii* fruit nicely on the synthetic medium employed. For experimental purposes they have the draw-

back that their „fructification-time" (the number of days from the inoculation to the shedding of spores) is long and variable — probably influenced by some external conditions not yet known. *Coprinus heptemerus* is superior to the four species mentioned above for the following reasons: 1) It is homothallic; 2) the „fructification-time" is normally 7 days; 3) the variation between parallel experiments may be surprising little.

The papers by LANGE (1952) and LANGE & SMITH (1953) give detailed information on the mentioned 5 species.

MATERIALS AND METHODS

All cultures were grown in 100 ml Erlenmeyer flasks on 20 ml medium. The composition of the synthetic medium (in this text named medium A) is: Maltose (Merck, cryst.): 10 g; $Ca(NO_3)_2$, 4 H_2O: 0,5 g; $MgSO_4$, 7 H_2O: 0,5 g; K_2HPO_4: 0,25 g; thiaminhydrochloride (Hoffmann—La Roche): 100 μg; »Difco«s Bacto agar: 15 g; dist. water made up to one liter. Medium A, with 1 % yeast extract replaced for thiamine, is named Y. M. All media were sterilised at 120° for 15 minutes. After sterilising pH was measured with a glass electrode. The yeast extract used was made from bakers yeast heated for 10 minutes at 110° C. and centrifuged clear.

Inoculations were made with pieces of agar (0.2×0.2 cm) from a Y.M. agar culture, in the liquid cultures floating on the surface (MELIN & LINDEBERG 1939). The mycelia from the liquid cultures were washed and weighed after drying at 100° C. for 24 hours. Mycelia from agar cultures were treated according to LILLY & BARNETT (1951). The strain of *C. heptemerus* used by me has been kept in culture since 1953 on Y. M. agar.

EXPERIMENT 1

Various amounts of heteroauxin were added to 4 series of Y. M. agar flasks. They were inoculated, and placed in daylight at 20—22° C.

Table 1

Heteroauxin in μg	0	20	200	1000
Number of parallels	8	8	8	4
Average dry weight in mg $\pm$m	49,4$\pm$1,0	47,6$\pm$1,0	47,6$\pm$2,1	47,3$\pm$2,5

Table 1 shows the details and the results. Spores were shed after 7 days in all 28 flasks. The experiment is recorded here — not to show the effect of heteroauxin — but to demonstrate the lack of variation in "fructification-time" and the statistical agreement in mg dry weight between the 4 series. This prooves the high quality of *C. heptemerus* for growth experiments.

EXPERIMENT 2

Y. M. agar with various amounts of yeast extract. $Ca(NO_3)_2$ replaced by ammonium nitrate (2 g pr. liter); daylight; 20—22° C.; incubation-time 18 days; 3 flasks.

Table 2

Yeast extract g/100 g	Dry weight in mg	Fruit bodies
1,25	362	normal
2,5	379	normal
5,0	379	normal
10,0	426	sterile

Table 2 shows the effect of various amounts of yeast extract. The series "1,25 %", "2,5 %" and "5 %", produced normal spore shedding fruit bodies. The serie "10 %" made sterile, "etiolated" fruit bodies.

EXPERIMENT 3

As mentioned above *C. heptemerus* does not grow on the synthetic medium, but addition of 1 per cent yeast extract gave good growth and fructification. This effect was tried imitated by adding to medium A following mixture of vitamins: Thiamine, riboflavine, pyridoxine, nicotinamide, Ca-pantothenate, p-aminobenzoic acid (all 50 μg per liter), and biotin (5 μg per liter). No growth was obtained.

The effect of various treatments of yeast extract was studied. To medium A (liquid cultures) was added: 1) 0.5 % yeast extract, 2) same treated with charcoal (1 g/100 ml), 3) same filtered 3 times through a kation filter (Amberlite IR-100), 4) same dialysed 24 hours in tap water. — Four flasks in each series, grown 11 days at 25° C.

Table 3

Treatment of 0,5% yeast extract	pH		Dry weight in mg
	Initial	final	
Control	7,1	7,2	55,2
Charcoal treated	6,9	7,1	3,5
Kation filtered	5,8	6,0	3,5
Dialysed	7,0	7,2	18,8

Table 3 shows that the various treatments have decreased the effect of the yeast extract much. The kation filter could e. g. remove NH_4^+ and some amino acids.

EXPERIMENT 4

8 different amino acids were tested separately. To liquid medium A was added 10 μmol amino acid per flask. The cultures were grown 2 months at room temperature. 3 flasks in each series.

Table 4

Nitrogen source added	Dry weight in mg
Control ($Ca(NO_3)_2$)	2,4
L-glutamic acid	0,7
L-tryptophane	2,2
DL-alanine	36,2
L-histidinemonochlorhydrat	1,2
Glycine	5,0
DL-phenylalanine	12,0
L-cystine	6,7
L(-)-tyrosine	39,2

Table 4 shows the results. Only DL-alanine, L(-)-tyrosine and to some extent DL-phenylalanine could support growth. Asparagine has been tested on the medium of HACSKAYLO et al. (1954) and could not be utilised at all. L. FRIES (1953) tried the effect of 21 different amino acids on *Coprinus fimetarius* at 44° C, but I do not think a comparison is justified as the *Coprinus* species and the experimental conditions are rather different.

EXPERIMENT 5

In this experiment the nitrogen sources potassium nitrate, ammoniumtartrate and L(-)-tyrosine were compared. Basal medium A, without calcium nitrate. All combinations were made in liquid media and on agar media. The cultures were grown 16 days at 25° C. — Four flasks in each experiment.

Table 5

Nitrogen source mg per flask	20 ml liquid per flask			20 ml agar medium per flask		
	Initial pH	Final pH	Dry weight in mg.	Initial pH	Final pH	Dry weight in mg
No nitrogen added	6,3	6,0	0,5	7,1	6,9	4,9
KNO_3: 10 mg	6,3	5,9	0,6	7,2	6,4	5,9
NH_4-tartrate: 20 mg	7,0	5,2	8,1	6,9	4,7	27,1
L(-)-tyrosine: 9,05 mg	6,9	6,3	14,8	7,1	6,4	23,0

Table 5 demonstrates the inability of *C. heptemerus* to use nitrate. Ammoniumtartrate and tyrosine can both be utilised. In the liquid series tyrosine is twice as effective as ammoniumtartrate. In the agar series the ammoniumtartrate is the best but the difference is not very large. At present I have no explanation for this peculiar difference. When grown on the ammoniumtartrate medium, *C. heptemerus* produces a dark orange pigment which diffuses a few millimeter out in the agar. On the tyrosine medium a clear yellow pigment is produced diffusing so rapidly that the whole agar is coloured.

The two synthetic media, viz. medium A with ammoniumtartrate and A with tyrosine as nitrogen source, permit a reasonable growth of *C. heptemerus,* but they are bad fructification media. Fruit bodies are allways obtained, but they are sterile and rather different from those produced on the Y. M. medium. An optimal synthetic fructification medium for *C. heptemerus* has not yet been found. The four species, *Coprinus bisporus, C. congregatus, C. plagioporus* and *C. sassii* fruit all on medium A as mentioned above. According to LANGE & SMITH (1953) they are all closely related to *C. heptemerus* although not belonging in the same subsection, but the physiological difference seems to be noteworthy.

SUMMARY

1) The coprophilous species *Coprinus heptemerus* LANGE & SMITH is well suited for fructification experiments for the following reasons: a) it is homothallic, b) fruit bodies are produced on 7 days on yeast extract maltose agar. Agreement in parallel experiments is very good.

2) *C. heptemerus* is thiamine-deficient; it cannot utilise nitrate, but ammoniumtartrate, alanine or tyrosine can be used.

3) Reasonable growth is obtained on synthetic media, containing alanine, tyrosine or ammoniumtartrate as nitrogen source, but only sterile, somewhat atypical fruit bodies are developed.

POSTSCRIPT

Note added in proof: Since this paper was sent in print. I received the dissertation of Dr. LISBETH FRIES: "Studies in the physiology of Coprinus" (1956), in which the physiology of 19 species of *Coprinus* have been investigated from various points of view. The thesis consists of the following papers: 1) Studies in the physiology of *Coprinus*. I. Growth substance, nitrogen and carbon requirements. — Sv. Bot. Tidskr. 49: 475 (1955); 2) Studies in the physiology of *Coprinus*. II. Influence of pH, metal factors and temperature. — Sv. Bot. Tidskr. 50: 47 (1956); 3) Studies in the physiology of *Coprinus*. III. Cultivation experiments with running media. — Bot. Not. 109: 12 (1956); 4) Mutations induced in *Coprinus fimetarius* (L.) by nitrogen mustard. — Nature 162: 846 (1948); 5) Factors promoting growth of *Coprinus fimetarius* under high temperature conditions. — Physiol. Plantar. 6: 551 (1953).

REFERENCES

Bille-Hansen, E.: Fructification of a coprophilous Coprinus on synthetic medium. — Phys. Plant. 6: 523—528. 1953.

— Fructification of three coprophilous species of Coprinus using glucose, sucrose, and maltose as carbon source. — Bot. Tidsskr. 50: 81—85. 1953.

Fries, L.: Über das Wachstum einiger Coprinus-Arten bei verschiedener Wasserstoffionenkonzentrationen. — Arkiv f. Bot. 32: 1—8. 1945.

— Factors promoting growth of Coprinus fimetarius (L.) under high temperature conditions.—Phys. Plant. 6: 551—563. 1953.

Hacskaylo, J., V. G. Lilly, & H. L. Barnett: Growth of fungi on three sources of nitrogen. — Mycologia 46: 691—701. 1954.

Hawker, L. E.: The effect of vitamin B, on the concentration of glucose optimal for the fruiting of certain fungi. — Ann. Bot. 6: 631—636. 1942.

Keyworth, W. G.: Investigations on the physiology of some Basidiomycetes. — Thesis, Univ. of London (cited by Hawker, 1942).

Lange, M.: Species concept in the genus Coprinus. — Dansk. Bot. Ark. 14, Nr. 6: 1—161. 1952.

Lange, M. & A. H. Smith: The Coprinus ephemerus group. — Mycologia 45: 747—780. 1953.

Leonian, L. H. & V. G. Lilly: Studies on the nutrition of fungi. IV. Factors influencing the growth of some thiamine-requiring fungi. — Phytopathology 28: 531—548. 1938.

Lilly, V. G. & H. L. Barnett: Physiology of fungi. — New York 1951.

Melin, E., & G. Lindeberg: Über den Einfluss von Aneurin und Biotin auf das Wachstum einiger Mykorrhizapilze. — Bot. Not. 1939: 241—245. 1939.

Copenhagen, February 1956.

ON THE DIMORPHISM OF THE ASCOSPORES AND THEIR ARRANGEMENT IN THE ASCUS OF MONILINIA OXYCOCCI (Wor.) Honey (SYN. SCLEROTINIA OXYCOCCI Wor.)

By N. FABRITIUS BUCHWALD

Contribution No. 46 from the Department of Plant Pathology, The Royal Veterinary and Agricultural College, Copenhagen.

It is an outstanding feature of the morphology of *Monilinia (Sclerotinia) oxycocci* (Wor.) Honey that four of the ascospores in an ascus are always much smaller than the other four spores, the proportion between the two sorts of spores being approximately 1:2, both in respect of the length and the width (cf. the spore dimensions given at the bottom of this page)*). This difference in the sizes of the ascospores within the same ascus — a difference which is also found in the most closely related species: *Monilinia baccarum* (Schröt.) Honey (cf. the annexed Fig. 1)**) — was, of course, observed already by the author of the species, M. Woronin (1885, 1888), and also by later authors (Rehm 1893 (1896), Schröter 1893 (1908), Shear 1931). Woronin writes on *Sclerotinia oxycocci* (1888, p. 29): „In ihrer Vertheilung und gegenseitigen Lage im Ascus ist dabei immer eine gewisse Symmetrie vorhanden, die in alle möglichen

*) Measurements of 10 big and 10 small ascospores gave the following results:
Big ascospores: 15.2×7.2 μ (variation: 14.3—16.5×6.0—8.3 μ).
Small — : 8.1×4.3 μ (variation: 6.0—9.8×3.8—4.5 μ).

**) The author knows only of one instance among other fungi, viz.: *Phaeobulgaria (Bulgaria) inquinans*, where a similar difference is found between the eight spores. In this species the small spores are also more light-coloured than the big ones, which are dark brown. Already Tulasne (1853, pp. 160—164) made this observation. Cf. also Moreau's treatise on *Bulgaria* (1914).

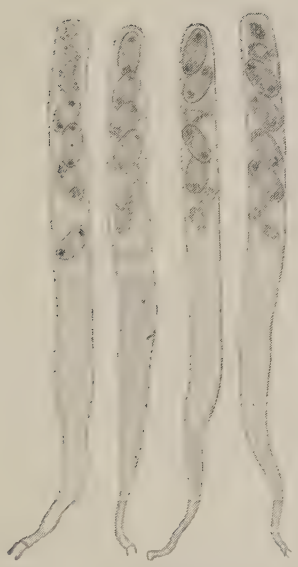


Fig. 1. Representation of WORONIN'S figures of four ripe asci of *Monilinia (Sclerotinia) baccarum,* with four big and four small spores, respectively, in each ascus (WORONIN 1888, Table VII Fig. 17). — Compare ascus types Nos. 1, 2, 3 and 5 in Fig. 2.

Variationen auftritt, wie man sich durch die Betrachtung der hier beigegebenen Figuren 9—13 (Taf. VII) sofort überzeugen kann. Die vier kleineren Ascosporen erweisen sich als unentwickelte, sind dabei keimungsunfähig und gehen sehr bald zu Grunde." A similar observation is made by SHEAR (1931), who — unlike WORONIN — furthermore points out that the distribution of the big and the small spores within the same ascus is irregular and, in illustration of this fact, depicts four asci (SHEAR, 1931, Fig. 11 A, p. 10) three of which correspond to asci Nos. 4, 5 and 9, respectively, in the accompanying Fig. 2.

A more thorough investigation of the spore arrangement in a larger number of asci shows, however, that the distribution is not so irregular by far as would appear at a cursory glance.

The author of this paper has examined in detail a hundred asci picked at random from a single apothecium and thereby been able to demonstrate 19 different types of arrangements of ascospores, of which the 12 occurring most frequently are depicted in Fig. 2. Some of those types, again, were much commoner than the others; for example, 18 asci of Type No. 1 and 15 asci of Type No. 5 were found in which the distribution may be characterized as "regular". The "irregular" types, on the other hand, were generally represented by a single ascus only; of Type No. 8 (Fig. 2 and 6) five asci were found, however. This distribution of the spores certainly tends to indicate that the development of big and small spores is determined genotypically, i. e. the size of the spores is determined by a pair of genetical factors, similarly to what has been demonstrated in respect of sex and colour in e. g. *Neurospora, Pleurage* and *Bombardia* (WILCOX 1928, DODGE 1930, AMES 1932, ZICKLER 1934).

The types of distribution concerned may be referred to the three following principal groups:

1st group: Asci Nos. 1—2 in Fig. 2; 30 asci in all.
2nd — : — — 3—6 - — 2; 46 — - - .
3rd — : The other types of asci, of which some are depicted as Nos. 7—12 in Fig. 2; 24 asci in all.

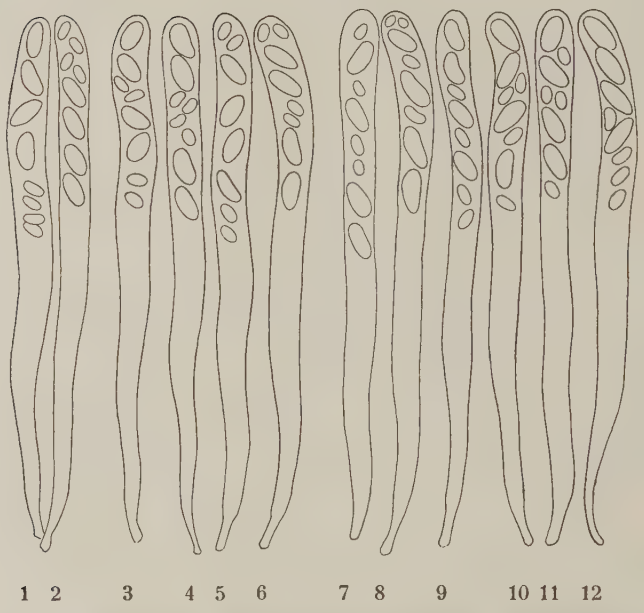


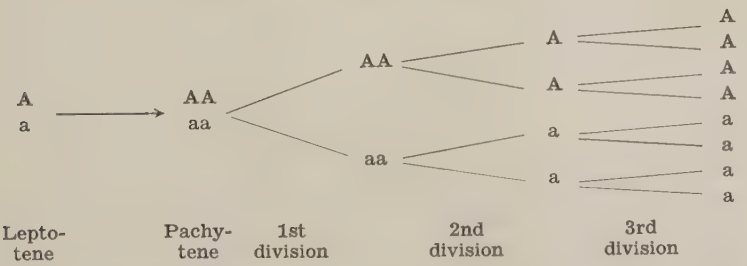
Fig. 2. The 12 ascus types most frequently occurring in *Monilinia (Sclerotinia) oxycocci*. Nos. 1—6 show regular location of the ascospores, resulting from prereduction (Nos. 1 and 2) and postreduction (Nos. 3—6), respectively. Nos. 7—12 show some of the irregular types of location most frequently occurring.

Let us, for simplicity's sake, term the pair of factors for the spore size Aa, A being the factor for the big ascospores and a the factor for the small ascospores. The distribution of the spores in the first group may then be denoted in either of these ways:

	Type No. 1	*Type No. 2*
	A	a
	A	a
	A	a
	A	a
	a	A
	a	A
	a	A
	a	A
Number of asci found:	18	12

This simple arrangement of the spores proves beyond any doubt that the segregation of Aa took place in the first meiotic division (prereduction), as shown schematically in Fig. 3 and represented in the diagram below: —

Diagram of prereduction (Type No. 1).



If, next, we consider the distribution of the spores in the second group, this can be denoted as follows:

	Type No. 3	*Type No. 4*	*Type No. 5*	*Type No. 6*
	A	A	a	a
	A	A	a	a
	a	a	A	A
	a	a	A	A
	A	a	A	a
	A	a	A	a
	a	A	a	A
	a	A	a	A
Number of asci found:	8	12	15	11

It is natural to assume that the types of distribution in question have arisen in the way that the segregation of Aa has only taken place during the second meiotic division, that is to say, after the occurrence of an interchange of chromatid parts between paternal

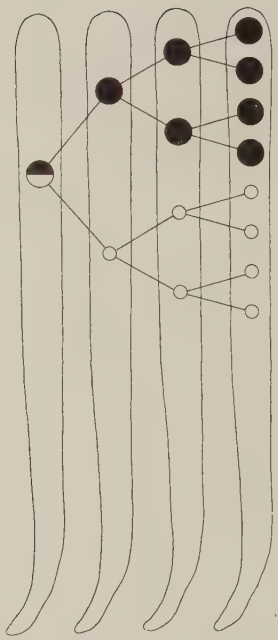


Fig. 3. *Monilinia oxycocci.* Diagram of prereduction showing location type No. 1 with four big ascospores at top and four small spores at bottom in the ripe ascus farthest to the right. The colour indicates whether the spores are germinable (dark) or not (light).

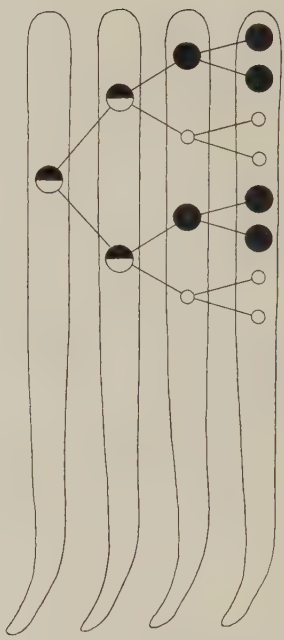
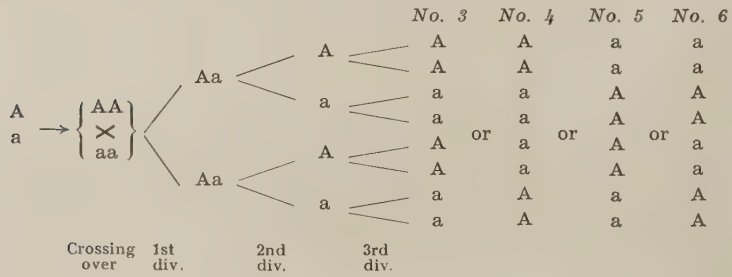


Fig. 4. *Monilinia oxycocci.* Diagram of postreduction. Location type No. 3 with two big spores alternating with two small ones in the ripe ascus to the right.

and maternal chromosomes by crossing over. This distribution, termed postreduction, is depicted schematically in Fig. 4 and 5 and can be illustrated as follows:

Diagram of postreduction.



Provided the foregoing assumptions are right, segregation of Aa would take place now in the first meiotic division (prereduction) and now in the second meiotic division (postreduction). If the attraction (or the repulsion, respectively) between two sister chromatids (chromosome halves) is equal to the attraction (or the repulsion, respectively) between two non-sister chromatids, the disjunction of the four chromatids may be expected to be purely accidental. Thus each individual chromatid would have the chance of pairing with the three others, one of which is a sister chromatid, the two others non-sister chromatids. If these possibilities are realised equally often, segregation of the pair Aa will take place half as frequently in the first division (prereduction) as in the second division (postreduction);

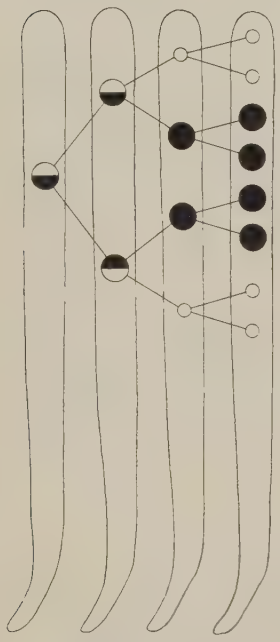


Fig. 5. *Monilinia oxycocci*. Diagram of postreduction. Location type No. 5 with two small spores at top and bottom and four big spores in the middle of the ascus.

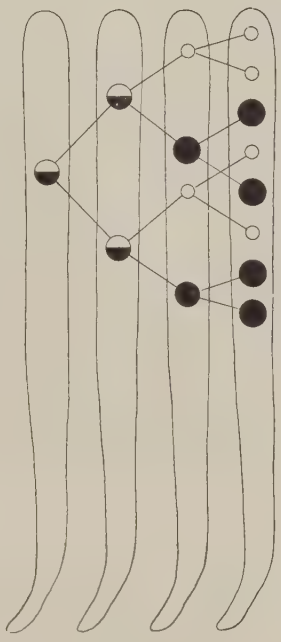


Fig. 6. *Monilinia oxycocci*. An example of irregular location in the ripe ascus, probably resulting from postreduction and displacement of two spindles during the third division. — Compare location type No. 8 in Fig. 2.

in other words, the ratio between prereduction and postreduction will be 1:2. Although the number of asci examined is very small (only 100), it will still be found that the ratio between the number of asci that may be referred to group 1, viz. 30%, and the number of asci that may be referred to group 2, viz.: 46% — i. e. approximately 1:2 — tends to indicate that the distribution of the spores in the former group is due to prereduction, whereas the distribution in the latter group is due to postreduction. By his far more comprehensive examinations of *Bombardia lunata,* ZICKLER (1934) arrived at a similar conclusion in respect of the segregation of the pair of factors (viridis — rubiginosa) for the colour of the ascospores of this ascomycete.

A study of the third group of ascus types, which represents 24% of the material examined, shows, however, that the segregation of Aa is not always as regular as described above. The irregular location of the spores in these cases tends to indicate that a translocation of the nuclei must have taken place, the spindles having shot past each other during one of the three divisions resulting in the formation of spores, and this has happened whether the segregation has taken place in the form of prereduction or postreduction. An example of the mechanism leading to an irregular location of the ascospores is illustrated in Fig. 6.

As far as is known, *Monilinia oxycocci* has not been the subject of either cytological or genetical examinations before, but it occurs to the author of this paper that this species of fungus, as well as *M. baccarum,* which is closely related to it, presents itself as an extremely favourable object of such examinations on account of the pronounced difference in the sizes of the ascospores.

ACKNOWLEDGMENT

I am very grateful to Mr. J. H. WANSCHER, Amanuensis, M. Sc., for his excellent assistance in the preparation of this paper.

LITERATURE

Ames, L. M.: An hermaphroditic self-sterile, but cross-fertile condition in Pleurage anserina. — Bull. Torrey Club 59: 341—345. 1932.

Dodge, B. O.: Breeding albinistic strains of the Monilia bread mold. — Mycologia 22: 9—38. 1930.

Moreau, F.: Sur le dimorphisme des ascospores de Bulgaria inquinans (Pers.) Fr. — Bull. Soc. Mycol. France 30: 361—367. 1914.

Rehm, H.: Ascomyceten: Hysteriaceen und Discomyceten. In Rabenhorst's Kryptogamen-Flora. I. Die Pilze. 1893 (1896).

Schröter, J.: Die Pilze Schlesiens. II. 1893 (1908).

Shear, C. L., Stevens, N. E. & Bain, H. F.: Fungous Diseases of the cultivated Cranberry. — U. S. Dept. Agric., Techn. Bull. 258: 1—56. 1931.

Tulasne, L. R.: Nouvelles recherches sur l'appareil reproducteur des champignons. — Ann. Scienc. nat., 3. Ser., 20: 129—182. 1853.

Woronin, M.: Ueber Peziza baccarum. — Ber. Deutsch. Botan. Ges. 3: LIX—LXII. 1885.

— : Über die Sclerotienkrankheit der Vaccinieen-Beeren. — Mém. l'Acad. Imper. Scienc. St.-Petersbourg, VII Ser; Tome XXXVI, No. 6. 1888.

Wilcox, M. S.: The sexuality and arrangement of the spores in the ascus of Neurospora sitophila. — Mycologia 20: 3—17. 1928.

Zickler, H.: Genetische Untersuchungen an einem heterothallischen Askomyzeten (Bombardia lunata nov. spec.). — Planta 22: 573—613. 1934.

Copenhagen, January 1956.

ORNAMENTATION OF SPORES OF RUSSULA LAUROCERACI MELZER AND RUSSULA FOETENS (PERS.) FR.

By KJELD BÜLOW

Russula lauroceraci MELZER was distinguished from *Russula foetens* (PERS.) FR. and set up as a particular species by MELZER (1927). According to SCHÄFFER (1952) it must be regarded as a distinct sub-species, only distinguished from *Russula foetens* by two characteristics, viz. by having a smell like bitter almonds and by the spores being cristate with long crests. SCHÄFFER is of the opinion that there are no intermediaries between the two types of spores.

RICKEN (1915) does not mention that *R. foetens* may have a smell like bitter almonds. J. E. LANGE (1940) mentions that the smell of *R. foetens* is sometimes suggestive of cherry laurel *(Prunus laurocerasus)* and that "this form is sometimes segregated sub nom. *Russula lauroceraci* MELZ.", but he does not mention the difference in the spores. He states that the spores of *R. foetens* are coarsely warty-spinulose, spores from later finds having ½—¾ μ long spinules, generally without connecting lines. Therefore, he cannot have seen the typical *lauroceraci* spores, which are markedly lamellate-cristate.

KÜHNER & ROMAGNESI (1953) distinguish between three species, viz.: *R. foetens* with warty-spinulose spores, a disgusting smell and a peppery taste; *R. grata* BRITZELMAYR with warty — partially reticulate — spores, a faint smell and a mild taste; and *R. lauroceraci* MELZER smelling like bitter almonds and having a peppery taste and cristate spores with long crests. PEARSON (1950) and MOSER (1953) distinguish between *R. foetens* and *R. lauroceraci* by spore ornamentation and smell.

In the autumn of 1952 I gathered in Riis Forest in Jutland some specimens of *R. foetens* which, apparently, were typical, but the smell of the fungi was quite pleasant, like that of bitter almonds. Microscopical examination by MELZER'S chloral-iodine mixture disclosed the typically cristate *lauroceraci* spores. For comparison, I examined spores of some specimens of *R. foetens.* and was sometimes surprised at finding spores of types intermediate between *lauroceraci* spores and *foetens* spores.

As may be known, the smell of *R. foetens* may vary considerably both in intensity and character. FERDINANDSEN & WINGE (1943) describe the smell as sweet and nauseous, and it is just this type of smell that is found in different mixtures.

TABLE

No. of specimen	Smell	Spore ornamentation
I	Almost just like that of bitter almonds	Markedly warty-spinulose, almost without connecting lines (7½—9 μ incl. ornament)
II	Faint, not characteristic	Like No. I (7½—10 μ)
III	Commonly mingled	Most closely resembling *lauroceraci* spores, but with rather low crests (< 1½ μ), a few of them warty-spinulose (8—10½ μ)
IV	Strong, mingled	Pronounced *lauroceraci* spores with crests > 2 μ (—4 μ); (9—10½—(12) μ)
V	Very disgusting	Like No. I; some spores, however, like No. III, but with more conglomerate crests; (9½—10½—(12) μ)

In the autumn of 1954 I again gathered specimens of *R. foetens* and *R. lauroceraci* and compared spores and smells. The Table contains types of spores and smells of five specimens of *"foetens"*, gathered at different places in Slagelse Forest (Zealand) in the autumn of 1954 (Fig. 1). It is evident that widely different types of spores are represented, and that the pronounced smell of bitter almonds is not always found in specimens with cristate spores. Finally, it appears that the same specimen may produce widely different spores, though a clear-cut type is usually predominant in a given spore print.

I III IV V

Fig. 1. Types of spores of four specimens of *Russula* »*foetens*«, gathered at different places.

The problem apparently calls for more detailed examination. Among other things, the taste ought to be accurately investigated (compare *R. grata* BRITZ.).

At any rate, it is evident that the problem of species is not at all as simple as formerly assumed.

BIBLIOGRAPHY

Ferdinandsen, C. & Winge, Ø.: Mykologisk Ekskursionsflora. 2nd. Ed. 1943.
Kühner, R. & Romagnesi, H.: Flore analytique des champignons supérieurs. 1953.
Lange, J. E.: Flora Agaricina Danica, Vol. 5. 1940.
Melzer, V. & Zvara, J.: Russulae bohemiae. 1927.
Moser, M.: Die Blätter- und Bauchpilze. 1953.
Pearson, A. A.: The Genus Russula. — The Naturalist 1948: 85—108, 1948; 2nd Ed. 1950.
Ricken, A.: Die Blätterpilze. I-II. 1915.
Schäffer, J.: Russula-Monographie. Die Pilze Mitteleuropas. Vol. III. 1952.

Slagelse, Denmark, January 1956.

TWO NEW SPECIES OF CORTICIACEAE FROM DENMARK

PENIOPHORA DANICA SP. N. AND CORTICIUM SALICICOLA SP. N.

By M. P. CHRISTIANSEN

In the following contribution two species, *Peniophora danica* and *Corticium salicicola,* are described and illustrated and proposed as new species. Both have been known to me since 1948.

1. Peniophora danica sp. n.

Sjælland: Hareskoven Forest, in a copse of willows, on a rotten piece of trunk of *Salix (cinerea?)* in a moist location, 27.9.1948 (!) and following years (!) (Nos. 259, 260, 261, 1296, 2264); in the same place on a decorticated but almost fresh piece of a trunk of *Sambucus,* 16.7.1950 and 12.10.1950 (!) (1074, 1161); Sønderskov Forest, in a copse of willows, on *Salix,* 4.11.1955 (BREGNHØJ LARSEN); Allerød, in a copse of willows close to the Bloustrød Path, on a rotten piece of wood, December 1955 (BREGNHØJ LARSEN).
(!) = own finds.

Fruit body resupinate, effused, adnate, at first thin and then lemon-greenish with a whitish to greenish-white, fringed margin, fully grown soft waxy-membranaceous, somewhat gelatinous, on the thickest portions ± densely covered by yellowish-light brownish, about 1 mm high and 1/4 to 1/2 mm wide warts or blunt-topped rounded upgrowths*); during drying-up, the fruit body shrinks heavily and assumes a much darker shade; the warts only become visible under a magnifying glass, and the thinnest portions of the fruit body can hardly be seen on the substrate.

When dried up, the fruit body is 150—300 μ thick; the basal texture is very loosely built up of ± cylindrical, thin-walled hyphae,

*) Colours from JAKOB E. LANGE'S colour plate: Margin l 3—l 4—k3, inwardly k3—e3—b5—g2—h1—h2 ("Studies in the Agarics of Denmark", Dansk Botanisk Arkiv, Bd. 4, Nr. 12, 1926).

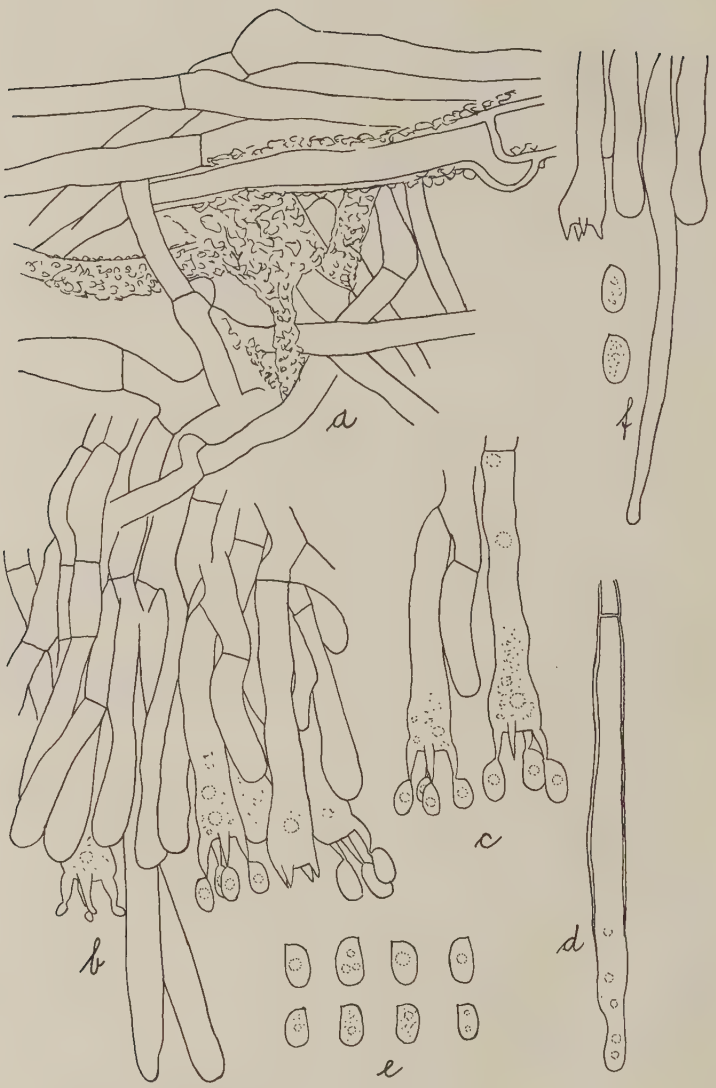


Fig. 1. *Peniophora danica* sp. n.
a. Hyphae; b. detail of hymenium; c. basidia; d. cystidia; e. basidiospores; f. detail of hymenium. — ×1250. a—d. drawn from Hareskov finds; f. drawn from Allerød find.

2—5 μ wide, with clamps, even and smooth closest to the substrate but intermingled with somewhat irregular, a little thick-walled, up to 7 μ wide hyphae, which are ± heavily coated with a yellowish, fine-grained, gritty mass and then forming stellate crystal lumps; subhymenial hyphae opaque, hyaline, thin-walled, closely interwowen; the hymenium consists of conglomerate basidia and few cystidia, though on the top of the warts there are often many.

Cystidia somewhat fusiform, hyaline, thin-walled, blunt to ± pointed, 45—60×5 μ, protruding up to 40 μ above the basidia.

Basidia clavate, thin-walled, 25—35×3.5—5 μ, with 4 sterigmata.

Spore powder pallid to faintly cream-coloured.

Spores ellipsoid, with a lateral tip, 4.5—6×2.8—3.2 μ; contents finely granulate or with a few droplets.

Latin diagnosis: Fructificatio resupinata, late effusa, adhaerens, juvenilis tenuis, citrino-viridis, margine albo vel albido-viridio, leviter fimbriato, mature laxe membranacea vel ceracea, leviter gelatinea, dense et obtuse tuberculata, lutea — ± brunnea (k3—e3 — b5 — g2 — h1 — h2, margine l 3 — l 5 — k3)*), siccitate valde contracta et obscure colorata; sicca 150—300 μ crassa; subiculum hyphis basidum laxe intricatis, cylindraceis, tenuiter tunicatis, 2—5 μ diam., nodoso-septatis, levibus, interdum usque 7 μ diam., ± crassiuscule tunicatis et valde luteo-incrustatis, hyphis subhymeniorum dense intricatis; cystidia sat sparsa, interdum numerosa, ± fusoidea, obtusa vel leviter acutata, 45—60×5 μ, usque 40 μ basidia superantes; basidia densi, clavata, 25—35×3.5—5 μ, 4 sterigmata gerentia; basidiosporae ellipsoideae, oblique apiculatae, granulatae vel guttulatae, 4.5—6×2.8—3.2 μ, tunicis tenuibus, levibus, non amyloideis.

Hab. Ad ligna Salicis et Sambuci, Dania.

2. Corticium salicicola sp. n.

Sjælland, Ermelunden, on the bark on the underside of a nearly horizontal, live stem of *Salix virens*. 30.10.1948 (!) (No. 246) and in the same place 2.10.1949(!) (644). The tree was later felled.

Fruit body resupinate, effused, membranaceous-waxy, fairly thick, about 300 μ, even or with a few warts, smooth, whitish-cream coloured, uniform out to the margin.

*) Colours from JAKOB E. LANGE'S colour plate in »Studies in the Agaries of Denmark«, Dansk Botanisk Arkiv, Bd. 4, Nr. 12, 1926.

Basal hyphae somewhat obscure, opaque, hyaline, thin-walled, smooth or slightly and somewhat irregularly thick-walled and ± incrusted, 1.5—3.5 μ wide, often with granulate contents, few clamps; hymenial hyphae thin-walled, 1.5—2 μ wide, as somewhat twisted.

Gloeocystidia few, clavate or ending in a bulb-shaped enlargement at top, thin-walled, nidulant or projecting somewhat over the basidia, 50—90×5—6.5 μ. Head slightly broader, contents even.

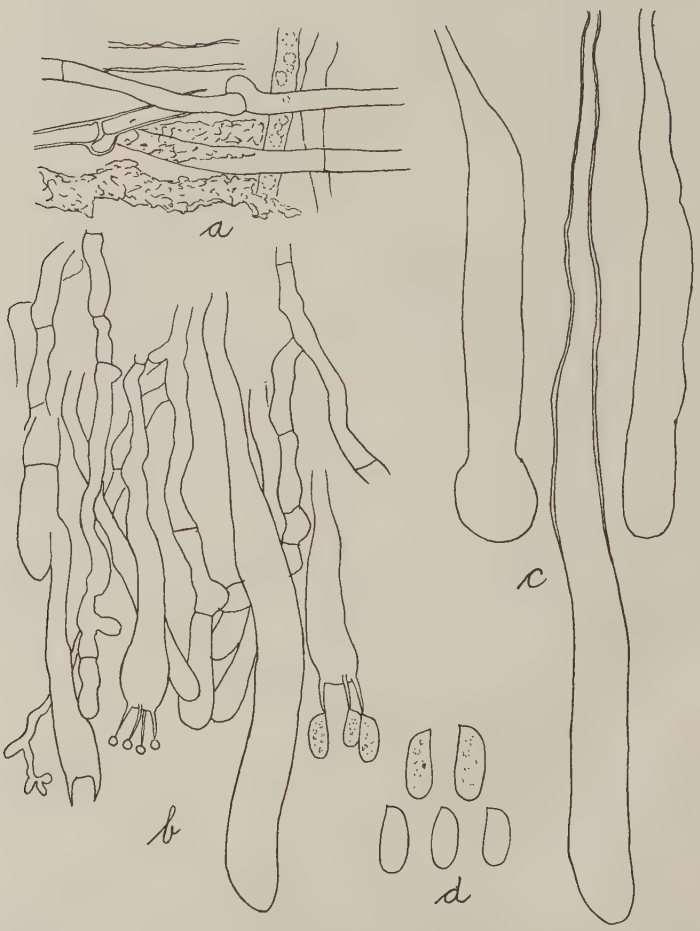


Fig. 2. *Corticium salicicola* sp. n.
a. Hyphae; b. detail of hymenium; c. gloeocystidia; d. basidiospores. — ×1350.

Paraphyses present, cylindrical, undulated, often branched at the end, 1—2 μ wide.

Basidia clavate, narrowing downwards, thin-walled, 20—32 × 4.5—6 μ, (2)— 4 thin sterigmata, 3—5 μ long.

Spores narrowly ellipsoid-oblong, obliquely acute towards the base, granulate, 6—8 × 2.4—2.8 μ.

Latin diagnosis: Fructificatio resupinata, late effusa, c. 300 μ crassa, membranacea vel ceracea, alba vel cremea, adhaerens, levis vel leviter tuberculata; subiculum hyphis intricatis tenuiter tunicatis, hyalinis, 1.5—3.5 μ diam., nodoso-septatis, levibus vel leviter incrassatis et incrustatis; gloeocystidia clavata, interdum capitata, tenuiter tunicata, e subhymenio emergentia, 50—90 × 5—6.5 μ; basidia clavata, 20—32 × 4.5—6 μ; 4 gracilia sterigmata gerentia; basidiosporae subellipsoideae vel subcylindraceae, oblique apiculatae, 6—8 × 2.4—2.8 μ, granulosae, tunicis tenuibus, levibus, non amyloideis.

Hab. Ad cortices *Salicis virentis,* Dania.

Copenhagen, January 1956.

A NEW SPECIES OF THE FORM-GENUS LICHENOCONIUM Petr. & Syd. (FUNGI IMPERFECTI), L. XANTHORIAE sp. n.

By M. SKYTTE CHRISTIANSEN

A parasitic fungus has on several occasions been noticed by the author on the apothecial disc of the lichen *Xanthoria polycarpa* (Ehrh.) Rieber. It belongs to the *Fungi Imperfecti (Sphaeropsidales-Phaeosporae)*, and as it differs from the already known species of this group, it is described here under the name *Lichenoconium xanthoriae*.

Lichenoconium xanthoriae sp. n.

Latin diagnosis: Pycnidia sparsa vel ± dense aggregata, apotheciis ± denigratis hospitis immersa, initio clausa et globulosa, deinde conice erumpentia cupulariterque dehiscentia, nigra colore, diam. 100—200 μ. Paries pycnidii 6—10 μ crassus, textura paraplectenchymatica, cellulis ± angulosis, paene isodiametricis vel ± ellipsoideis, 2—3-stratificatis, externis autem cellulis membrana crassa obscuraque instructis. Conidiophora hyalina, aseptata, subcylindrica, 6—10 μ longa, 2—4 μ crassa, apicem versus attenuata, unde conidia formantur. Conidia sphaerico-subovoidea, fusca, simplicia, 2.5—4 × 3—5 μ, cicatrice praedita.

Habitatio: parasitice in apotheciis lichenis *Xanthoriae polycarpae* per Daniam et Sueciam meridionalem.

Locus classicus: Dania, Jutlandia borealis, in parochia Råbjærg (in Cimbrorum promontorio), parasitice in apotheciis *Xanthoriae polycarpae* (habitantis ramulos emortuos *Cytisi scoparii*, in pineto loco arenoso posito). Legit M. Skytte Christiansen 26.6.1942. Typus in Herbario Musei Botanici Hauniensis.

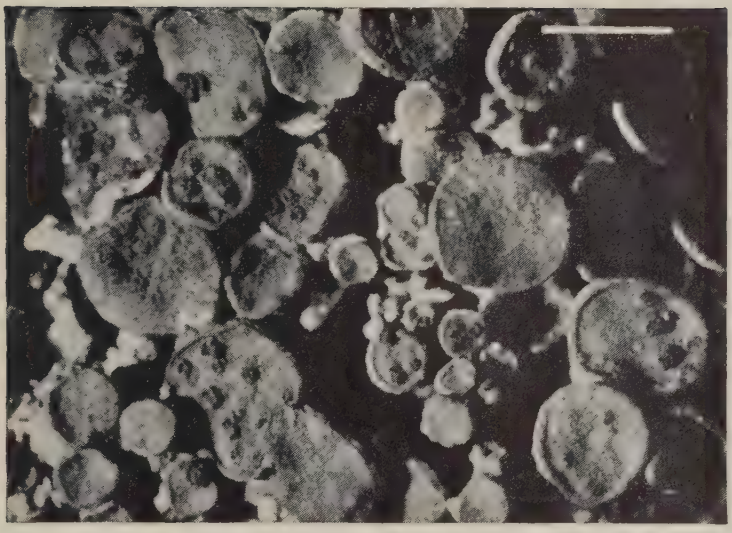


Fig. 1. *Lichenoconium xanthoriae* (type collection).
Pycnidia on the apothecial disc of *Xanthoria polycarpa* (EHRH.) RIEBER (magnification 19×, the white line at the top corresponds to 1 mm).

Description of the new species (see Figs. 1 and 2):

Pycnidia scattered or ± densely aggregated, at first globose and immersed in the hymenium of the apothecia of the host (reaching down into the upper part of the hypothecium), later conically erumpent, opening by rupture of the pycnidium-wall and becoming cup-shaped, diam. 100—200 μ. The sides of the erumpent pycnidia remain covered by a thin layer of the epithecium of the lichen.

The wall of the pycnidium is 6—10 μ thick, of paraplectenchymatic structure, composed of 2—3 layers of irregularly angular, almost isodiametric or oblong cells, 3—6 × 3—8 μ. In young pycnidia only the cells of the external part of the pycnidium-wall have thick, dark-coloured membranes, later all cells of the pycnidium-wall get thick, brown membranes. The inside of the pycnidium-wall is covered by closely standing, 1-celled, subcylindric conidiophores, which get narrower towards their tips, 6—10 μ long, 2—4 μ thick. The membrane of the conidiophore is thin, and in older pycnidia the conidiophores have almost disintegrated.

The conidia are formed in succession at the tips of the conidiophores (sometimes 2 or 3 conidia remain attached to each other);

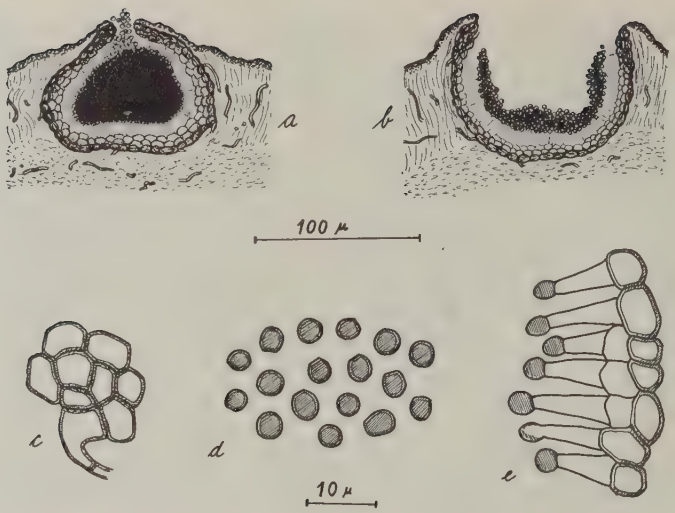


Fig. 2. *Lichenoconium xanthoriae* (type collection).
a and b: sections through pycnidia in the hymenium of *Xanthoria polycarpa* (EHRH.) RIEBER; the lichen tissue (epithecium, paraphyses and hypothecium) is indicated schematically. — c: cells of the pycnidium-wall (from a tangential section of a pycnidium). — d: conidia. — e: part of a section through a pycnidium showing wall-cells and conidiophores with young conidia.

they are thick-walled and brown, sphaerical to broadly ovoid, with a distinct hilum, 2.5—4×3—5 μ. The conidia to some degree agglutinate and form a mass which completely fills the cavity of the still closed pycnidia. The membrane of the conidia may sometimes have a somewhat scabrous appearance, possibly due to the substance which keeps the conidia together. The spores exude as a mass from the open pycnidia when these are moistened.

The mycelium of *Lichenoconium xanthoriae* is difficult to trace outside the pycnidia in sections of the host tissue, only a few sinuous, light-brown to almost hyaline, 1.5 μ wide hyphae are seen.

The parasitized apothecia of the lichen have a somewhat degenerated hymenium. Only a few asci are still containing spores, most of the asci being empty and conglutinated with the paraphyses. No young asci are seen, nor any deeply staining ascogenous hyphae. The margin and the subhymenial tissue of the apothecia do still contain living algae. The colour of the apothecial disc may still be yellow as in unaffected apothecia (this coloration is due to a granular substance, parietin, excreted by the tips of the paraphyses and forming an

epithecium), but more often the parasitized apothecia are ± dark-coloured (this coloration is caused by the spores of the parasite being deposited on the surface of the lichen apothecium).

Type locality of *Lichenoconium xanthoriae:*

Denmark: North Jutland, Råbjærg parish, Bunken Klitplantage, on the apothecia of *Xanthoria polycarpa* (Ehrh.) Rieber growing on dead branches of *Cytisus scoparius* (L.) Link in a pine plantation on dune sand. Collected 26.6.1942 by M. Skytte Christiansen (Collection no. 8564). The type material is deposited in the herbarium of the Botanical Museum of the University of Copenhagen.

Distribution of *Lichenoconium xanthoriae:*

Lichenoconium xanthoriae is at present known from several localities in Denmark and the southern part of Sweden, and it has until now only been collected on *Xanthoria polycarpa*. It may, however, have a much wider distribution, the area of its host-plant extending over the greater part of the Northern Temperate Zone (Europa, North Africa, North America).

Danish localities of *Lichenoconium xanthoriae:*

Jylland: Råbjærg: Bunken Klitplantage (8564) 1942 (type locality). — Agri: Mols Bjærge (9890 and 10404) 1943. — Oksby: Krogsande (7271 and 7286) 1941. — Ho (6937 and 7409) 1941. — Skærbæk: Gasse Skrop (12352) 1944.

Anholt: Ørkenen (6185) 1941.

Sjælland: Årby: Asnæs Forskov (12256) 1944. — Helsingør (17301) 1955. — Blovstrød: Lillerød (13323) 1948. — Holbæk: Tveje Merløse (7621) 1941. — Kildebrønde: Hundige (2403) 1938. — Solrød: Solrødstrand (5908) 1940.

Lolland: Thoreby: Sundby Strand (10635) 1943.

All Danish collections have been made by the author, the numbers in brackets being the collection-numbers.

Swedish localities of *Lichenoconium xanthoriae:*

Skåne: Rörum: Vik 1947.
Västergötland: Trollhättan: Stavered: Lillgården (4883) 1948.
Östergötland: Ragslösa: Borghamn (4888) 1948.

All Swedish collections have been made by Dr. Rolf Santesson, Uppsala, and have been inspected by me.

After having recognized *Lichenoconium xanthoriae* as a distinct species, I sent herbarium-specimens to Dr. ROLF SANTESSON. The species was then found by him in Sweden, and its occurrence here published without indication of locality (SANTESSON 1949, 142). Dr. SANTESSON has kindly permitted me to publish these localities here, for which obligingness I am greatly indebted to him.

Discussion of the systematic position of the new species:

The form-genus *Lichenoconium* was established by PETRAK & SYDOW (1927, p. 432) to include species formerly referred to the form-genus *Coniothyrium* CDA., emend. SACC. (1880, p. 7), but having to be separated from this genus on account of the following characters:

1⁰. Pycnidia open irregularly, at last becoming erumpent and ± cup-shaped, while in *Coniothyrium* the pycnidia are opening with a minute ostiolum or a simple porus, and are as a rule immersed, except at the top.

2⁰. The conidia are formed on distinct conidiophores, not on protruding parts of the cells of the pycnidium-wall, as in *Coniothyrium*.

Owing to the insufficient observations concerning many species of *Coniothyrium* hitherto described it is difficult to ascertain, whether the above generic distinctions are really clear-cut and constant. The authors of the genus *Lichenoconium* have, however, formed their opinion after a careful study of the type specimens of a long series of species of the form-genus *Coniothyrium*. Until further studies have been made, I think it best to keep the two form-genera apart. No ascus-producing fungus connected with species of the form-genus *Lichenoconium* is known.

Most species of *Lichenoconium* are parasitic on lichens. In the monograph on lichen-parasites by KEISSLER (1930, p.558) 5 lichenicolous species of this form-genus are listed from North and Central Europe.

The new species seems to have some resemblance in size and form of the pycnidia to *L. lichenicolum* (KARST.) PETR. & SYDOW, according to the descriptions of the type specimen made by KARSTEN (1887, p. 104) and by PETRAK & SYDOW (1927, p. 432). I have not been able to study the original material, but a comparison of the descriptions of form and size of the spores and the conidiophores clearly shows that the two species cannot be identical:

Lichenoconium lichenicolum: spores oblong-ovoid or club-shaped, 5—8 (—10) × 2.5—4.5 μ. The length of the conidiophores does scarcely exceed that of the spores.

L. xanthoriae: spores subsphaerical or broadly ovoid, 3—5×2.5—4 μ. The length of the conidiophores 2—3 times that of the spores.

A search of the available literature, especially VOUAUX (1914, p. 291), for lichenicolous species referred to the form-genus *Coniothyrium,* which might be identical with *Lichenoconium xanthoriae,* was without result.

ACKNOWLEDGEMENT

The author wishes to thank Mr. K. E. JENSEN, M. A., for help with the Latin diagnosis of the new species.

REFERENCES

Karsten, P. A., 1887: Symbolae ad Mycologiam Fennicam. Pars XXI. — Meddel. Societas pro Fauna et Flora fennica 14: 103—110.

Keissler, K. v., 1930: Die Flechtenparasiten. Rabenhorst's Kryptogamen-Flora. 2. Aufl. Bd. VIII, 712 pp.

Petrak, F. u. Sydow, H., 1926—1927: Die Gattungen der Pyrenomyzeten, Sphaeropsideen und Melanconieen. 1. Teil: Die phaeosporen Sphaeropsideen und die Gattung Macrophoma. — Fedde, Repert. spec. novar., Beih. Bd. XLII, 551 pp.

Saccardo, P. A., 1880: Conspectus generum fungorum Italiae inferiorum, nempe ad Sphaeropsideas, Melanconieas et Hyphomycetes pertinentium, systemate sporologico dispositorum. — Michelia 2: 1—38.

Santesson, R., 1949: Svampar som leva på lavar. — Sv. Bot. Tidskr. 43: 141—143.

Vouaux, l'abbé L., 1912—1914: Synopsis des Champignons parasites de Lichens. — Bull. Soc. Myc. France 28: 177—256; 29: 33—128, 399—494; 30: 135—198, 281—329.

Copenhagen, February 1956.

A NEW EUROPEAN CLAVARIA: CLAVULINOPSIS SEPTENTRIONALIS SP. NOV.

By E. J. H. CORNER

Botany School, Cambridge.

In December 1954, Mr. L. HJORTSBERG, Umeå, Sweden, sent me a painting and dried specimens of a clavaria collected by him from four localities in Sweden. It did not agree with any known European species, and I was much puzzled until I saw that the basidia had four to six sterigmata, as in the Malayan *Clavulinopsis hastula*. Its alliance lay clearly with the small phycophilous species which I put in section B of *Clavulinopsis* (CORNER, 1950, p. 346). Indeed, had the fungus been sent to me from the tropics, whence I have several more to describe, I should have been in no doubt, but the mind becomes "pigeon-holed" in its European dealings and has yet to learn that the European fungus-flora, though traditionally the fount of mycology, is in fact but a small part of the world-flora.

Clavulinopsis septentrionalis is very close to the Malayan *C. hastula,* which has softly gelatinous, flattened and pinkish fruit-bodies with unevenly inflated hyphae. The north temperate *C. vernalis* (SCHW.) has 2—4-spored basidia, longer spores, and smaller fruit-bodies. *C. calocera* (MARTIN), from Colombia, is 4-spored with larger spores and has rich yellow, very toughly gelatinous fruit-bodies with stout hyphae, 20 μ wide. By analogy with these, I expect that the hyphae of *C. septentrionalis* may grow in intimate contact with soil-algae.

Clavulinopsis septentrionalis sp. nov.

Receptacula ad 20 mm. alta, clavata, superne ad 2—4 mm. lata, simplicia vel plus minus subdigitata, compressa, levia vel subrugosa, gregaria, ochraceo-flavidula vel subaurantiaca, translucentia,

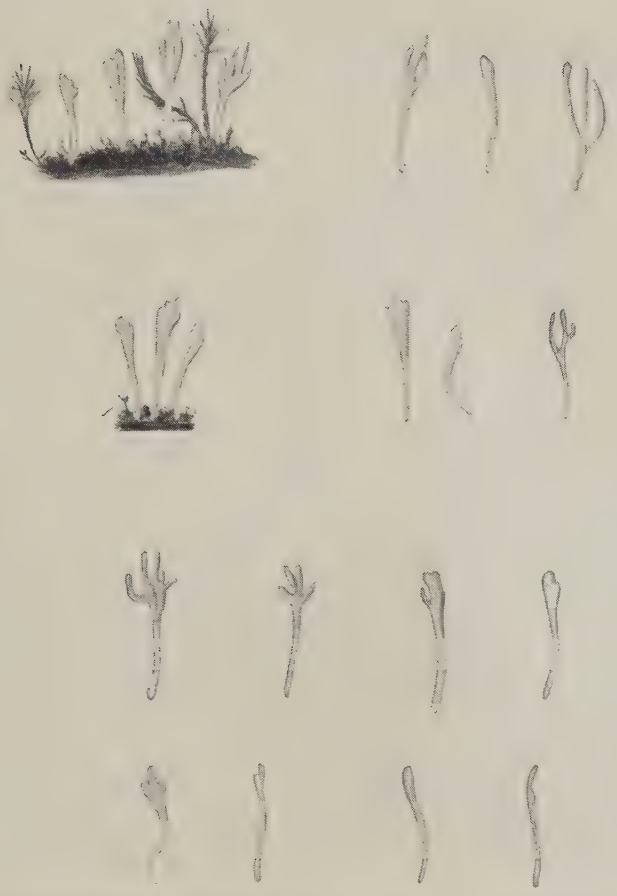


Fig. 1. *Clavulinopsis septentrionalis* sp. nov. Figures (watercolour) executed from nature by Mr. L. HJORTSBERG. Nat. size.

apicibus albidis: stipite 1—1.5 mm. lata, basi subcaesia: carne tenera, pallida, inodora, insipida: ad terram arenosam vel argillaceam et propter vias in pinetis, Suecia.

Sporae 5—7×2.5—3μ, hyalinae, leves, ovoideo-ellipticae vel subcylindricae, breviter apiculatae, ut videtur aguttatae.

Basidia 25—35×5μ, clavata vel pyriformia, sterigmatibus 4—5—6, 4μ longis, incurvatis: hymenium ad 100μ incrassatum: cystidia nulla: hyphae subhymeniales 2—3μ latae, tenuiter tunicatae, subgelatinosae.

Hyphae 3—12μ latae, fibulatae, inflatae, tenuiter tunicatae, in stipite et propter subhymenium plus minus tenaciter gelatinosae, cellulis regulariter inflatis, etiam fibulis inflatis.

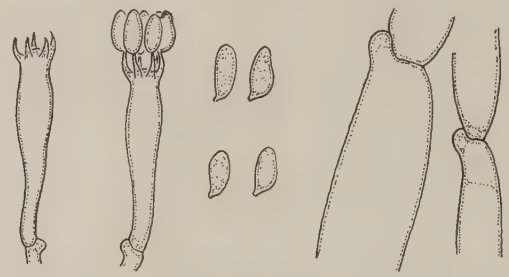


Fig. 2. *Clavulinopsis septentrionalis* sp. nov. Spores, basidia and hyphae. ×1000.

Collections: Stöcksjö, parish of Umeå, 24 Aug. 1949, on sandy earth in forest clearing among low moss and *Calluna* in pine-wood. — Stöcksjö, parish of Umeå, 9 km south of Umeå, 18 Aug. 1950, Aug. 1951, 16 Aug. 1953, 20 Aug. 1954, 2 Sept. 1954, in gravel-pit in pine-wood. — Håkmark, parish of Umeå, 14 Aug. 1950, 8 Sept. 1953, by forest road in sandy pine-wood. — Stöcke, parish of Umeå, Aug. 1951, 17 Sept. 1953, 6 Oct. 1953, by forest-road on bare soil, pine-wood. Leg. L. Hjortsberg.

Typus: Stöcke, parish of Umeå, 17 Sept. 1953. Institutionen för Systematisk Botanik, Uppsala, Sweden.

REFERENCE

Corner, E. J. H. (1950): A monograph of Clavaria and allied genera. — Ann. Bot. Mem. n. 1.

Cambridge, February 1956.

COPRINUS COMATUS (Schum.) Fr. SPRENGER ASFALT I BERGEN, NORGE

Av ANDERS DANIELSEN

I slutten av september 1955 kom det inn en pakke til Universitetets botaniske museum i Bergen. Innholdet, som ble fotografert av „Bergens Tidende" like etter ankomsten, er avbildet på tavle her (s. 222).

Ved et besøk på voksestedet fikk jeg noen nærmere detaljer om forekomsten. Soppene vokste opp inne i et mørkt skur på Veivesenets hovedlager på Grønneviksøren i Bergen. Gulvet i skuret ble asfaltert på tomtens eldre fyllmasser for en del år tilbake.

At noe var i gjære la man først merke til ved at asfaltdekket begynte å heve seg på forskjellige små og vel avgrensete partier — omtrent som en slags bobler under overflaten. Lagerformannens nysgjerrighet var vakt, og han lot forhøyningene utvikle seg uten inngrep. I løpet av ca. 1 døgn hadde den avbildete gruppe vokset frem, og den ble raskt sendt til museet „forat botanikkstudentene skulle få se den merkelige og kraftige soppen". Det kan ellers nevnes at en annen sprengning ble forhindret ved harde slag med en slegge på asfaltbulken.

Det var til en viss grad overraskende at fruktlegemene vokste opp inne i et skur, da blekksoppene trives best på lysåpne steder. Men dette skulle vel gi et visst håp om at de ikke kommer igjen inne i skuret.

En slik ruptur i asfalt gjør et sterkt inntrykk første gang man ser den — ganske spesielt fordi den var laget av en bløt og lett forgjengelig *Coprinus*. Man tenker uvilkårlig på den kraft som må til for å sprenge asfalt med hakke eller trykklufthammer. Det skal imidlertid innrømmes at sammenligningen halter. Hva gatearbeideren klarer på få sekunder, har soppen brukt diverse timer — og tilsvarende mindre kraft — på. Jeg har ikke funnet noe tall for hvor

mange atmosfærers trykk voksende sopper kan utøve. I „Växternas Liv", bd. 1, p. 241, angir ROMELL opp til 12 atm. rent generelt på overflaten av voksende organer.

Nå er tilfellet i Bergen på ingen måte enestående. Ifølge opplysninger fra amanuensis ECKBLAD bryter sjampinjonger årvisst gjennom asfalten på bestemte steder i Oslo.

Fra „Växternas Liv" (ovennevte bd., p. 239) anføres: Voksende sopper har i sin tid sprengt asfalten et sted i Stockholm og en steinlegning i Köping. I et annet tilfelle skal en steinblokk på 160 kg være blitt løftet av voksende sopper. Følgende morsomme notis sto i den engelske avisen „Cheltenham Examiner" i 1841: „Forleden torsdag utførte tre eller fire store sopper en ny slags heltedåd da de på en av våre folkerikeste gater, i sin ivrige streben etter å bryte frem i den synlige verden, formelig løftet bort en stor gatestein." Sitatet er blitt klassisk fordi SCHOPENHAUER bruker det som bevis på den såkalte viljekraften eller livsviljen i naturen.

Professor BUCHWALD har gjort meg oppmerksom på et godt bilde av en *Coprinus* (utvilsomt *C. atramentarius)*, „der den Steinbelag eines Kellers in die Höhe hebt" (Zeitschr. f. Pilzkunde, Bd. 18 (N. F.), Tafel 3, 1939).

SUMMARY

Coprinus comatus breaks through asphalt in Bergen, Norway.

Fruiting bodies broke through an asphalt ground cover of c. 5 cm thickness in a dark store-house. Especially *Psalliota spp.* often break through asphalt, and are regularly found in Oslo. Breaking by *Coprinus spp.* might be considerably less frequent.

LITTERATUR

Romell, Lars-Gunnar: De gröna växternas kraftkälla. — Växternas Liv I: 238—270, 1932.

Bergen, januar 1956.

Et stykke asfalt, ca. 5 cm tykk, og opp gjennom denne har en gruppe pene og velutviklete eksemplarer av mat-blekksopp (*Coprinus comatus* FR.) brutt seg vei. De har laget en stor rift i den seige og solide masse.

SOME OPERCULATE DISCOMYCETES NEW TO NORWAY

By FINN-EGIL ECKBLAD

The knowledge of Norwegian operculate *Discomycetes* is extremely scanty. The historical basis was formed by GUNNERUS (1766, 1772) and SOMMERFELT (1826). None of GUNNERUS' specimens has been left, but many of the species recorded by SOMMERFELT are still to be seen in the Herbarium of the Botanical Museum of Oslo. Some of his collections, however, contain but few specimens or only one, sometimes badly preserved, thus rendering a verification of his determinations in certain cases rather difficult. Later on A. BLYTT (1892) recorded *Discomycetes* from Dovre, Central Norway, and ROSTRUP (1904) determined a large number of gatherings made by BLYTT and his collaborators. Since then the interest in these fungi died away, though records of species new to our flora have been published from time to time, viz. *Caloscypha fulgens* (STØRMER 1946), *Bulgaria globosa* (NANNFELDT 1938), *Anthopeziza protracta* (GELIN 1938), *Pithya cupressina* (NANNFELDT 1949), and *Helvella acetabulum* (ECKBLAD 1953). In 1949 NANNFELDT published a study of the Swedish species of *Sarcoscyphaceae,* including several records of Norwegian representatives.

Although the exact number of operculate *Discomycetes* known to Norway cannot be given, it seems obvious that still several species remain to be discovered. In this paper I have the pleasure to report 10 species as new to Norway.

My thanks are due to Professor J. A. NANNFELDT who has given me valuable help with several identifications and references to

literature. Thanks are also due to the many collectors who placed their collections at my disposal.

The following abbreviations indicate the herbaria in which specimens are deposited:

(O) Botanical Museum, Oslo
(U) Institute of Systematic Botany, Uppsala.

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1. Ascobolus carbonarius KARST.

Norwegian records:
O s l o: Bygdøy, near the statue of Carl-Johan, Aug. 10. 1952, F.-E. ECKBLAD (O).
A k e r s h u s: Bærum: At the Lysaker river near Jar, Sept. 3. and Sept. 17. 1955, F.-E. ECKBLAD (O).

Seemingly not reported from Norway before. Confined to burned places. It seems to be the only species of *Ascobolus* growing on that substrate in our country. Easily recognized by the characteristically sculptured spores.

2. Disciotis venosa (PERS. ex FR.) BOUD. — Syn.: *Peziza venosa* PERS. ex FR.

Norwegian records:
O s l o: Bygdøy, under *Larix* at the café »Rodeløkken«, April 7. 1955, F.-E. ECKBLAD (O).

The spring-fungi of Norway, as of most countries, are not well known. Among the lesser known *Discomycetes* occurring at that time of the year, are *D. venosa* and *Discina perlata* (FR.) FR. They have often been taken for one another. During the last two years I have studied Norwegian material which, judging from habit and time of collecting, might be either of them. Thus I have been unable to trace any specimen of *D. venosa,* whereas *D. perlata* is now known from at least 15 places in Southern Norway.

In early spring of 1955, however, I collected several specimens of a rather large (4—7 cm in diam.), deeply cupulate discomycete. The hymenium was dark reddish brown, almost the same colour as in *Gyromitra esculenta* (PERS. ex FR.) FR. Excipulum dingy white,

somewhat pruinose. Most specimens proved to be immature, but at least three of them contained mature ascospores, 20—22.5×10.5—11.5μ. The microscopical analysis showed them to belong to *Disciotis venosa*. It is readily distinguished from *Discina perlata* by the spores which are apiculate in the latter, but ellipsoid and non-apiculate in the former.

3. Geopyxis carbonaria (A. & S. ex. Fr.) Sacc. — Syn.: *Peziza carbonaria* A. & S. ex. Fr.

Norwegian records:
Akershus: Bærum: Eiksmarka Aug. 1953, F.-E. Eckblad (O); Near Ramsåsen, May 28. 1954, F.-E. Eckblad (O); At the Lysaker river near Jar, Sept. 3. 1955, F.-E. Eckblad (O). — Asker: Slottsberget, May 28. 1955, S. G. Sundbye (O).

Apparently this species has not been reported from Norway before. It grows exclusively in burned places, where it is one of the more conspicuous species. Easily recognized by its deeply cupulate, short-stipitate, dull yellowish apothecia which have crenated margins. It is probably rather common.

4. Helvellella sphaerospora (Peck) Imai. — Syn.: *Helvella sphaerospora* Peck, *Gyromitra sphaerospora* (Peck) Sacc.

Specimens preserved:
Akershus: Bærum: Near the Sinober bridge in Sørkedalen, June 1948, S. G. Sundbye (O), (U); July 10. 1949, S. G. Sundbye (O).

In Norway this curious discomycete is known from only one locality. Mr. S. G. Sundbye, the collector of the species, has kindly informed me that he first discovered it in 1941, and has seen it fructificate almost every year since. It developed most abundantly in the dry and hot summer of 1947, the year in which the largest specimen occurred, measuring 28 cm high.

It is easily distinguished from any Scandinavian species of *Helvella* by its globose spores. Macroscopically it may be recognized by the large size of the apothecia and the pinkish colour of the base of the stipe. Spores uniseriate, hyaline, 8.5—10μ in diam., mostly with one large oil-drop.

5. Helvella arctica NANNF. — Syn.: *Paxina arctica* (NANNF.) E. K. CASH.

Norwegian records:

Sør-Trøndelag: Oppdal: Kongsvoll, about 1 km W of the hotel, July 31. 1952, F.-E. ECKBLAD (O). — Troms: Sørfjord: Breivikeidet, Aug. 29. 1954, F.-E. ECKBLAD (O).

This small black and disciform, stipitate *Helvella* was described by NANNFELDT (1937) on several Swedish collections. It is distinguished from *H. corium* (WEBERB.) MASS., its nearest relative, by the white tomentum covering the border and upper parts of the apothecium.

Very probably it is an arctic-alpine species with more or less Northern circumpolar distribution. It was collected in Spitzbergen in 1868 by TH. M. FRIES (NANNFELDT l. c.), and was recently discovered in two localities in Alaska (CASH 1954).

From Switzerland FAVRE (1955) describes a new variety, var. *macrosperma* FAVRE, distinguished by the larger spores (20—23 × 13.5—15.5 μ). He collected it in three places in Engadine, one in Val Nüglia, and two at Murtaröl, all specimens at rather high altitudes 2400 to 2550 m a. s. l.).

6. Humarina aggregata (BERK. & BR.) SEAVER. — Syn.: *Peziza aggregata* BERK. & BR., *Humaria aggregata* (BERK. & BR.) SACC.

Norwegian records:

Akershus: Skedsmo: Bråteskogen near Strømmen, May 1942, F. CHR. SØRLYE (U), and May 25. 1942, F. CHR. SØRLYE (O).

Hedmark: Våler: Blakavegen, between Enberget and Gravberget, May 22. 1947, O. FURUSET (U).

Buskerud: Norderhov: Eikli SW of Hønefoss, May 31. 1954, F.-E. ECKBLAD (O).

This bright orange discomycete occurs gregariously or in dense masses in spring on burned places or on needle beds in coniferous woods. The apothecia arise from a visible mycelial mat, and may reach a diameter of 5 mm. The spores are fusoid, 18—20 × 7—8.5 μ, smooth, hyaline, and mostly with two small oil-drops. Paraphyses septate below, strongly enlarged above, reaching a diameter of 5—6 μ.

The first Norwegian gathering of *H. aggregata* known to me, was made by the late Mr. F. CHR. SØRLYE, an interested amateur botanist, who collected it in Bråteskogen near Strømmen in the neighbourhood

of Oslo in May 1942. These specimens were sent to professor NANNFELDT for determination, and are kept in the Herbarium of the Botanical Museum, Uppsala.

7. Melastiza miniata (FUCK.) BOUD. — Syn.: *Humaria miniata* FUCK.

Norwegian records:

Akershus: Frogn: On a road near Drøbak south of the fortresses, Sept. 12. 1954, G. & F.-E. ECKBLAD (O).

Buskerud: Norderhov: Veienmoen, on a road, Aug. 23. 1953, F.-E. ECKBLAD (O).

This small and rather inconspicuous discomycete which so far has been found only twice in Norway, may at first sight be confounded with *Aleuria aurantia* (PERS.) FUCK. It differs from the latter i. a. in the smaller size, the colour of the hymenium which is slightly duller, and in having the excipulum furnished with hairs. At the margin the hairs are bound together in fascicles.

Asci cylindrical, 8-spored. Spores hyaline, ellipsoid, 14—17.5 × 7—9.5 μ (without sculpturing), usually with two small oil-drops. The sculpturing soon forms a distinct reticulum, and mostly gives rise to a rather large apiculus at either end. Parafyses clavate above, granulated. Our specimens agree well with the description by GRELET (1942, p. 22) who gave the spore-size as 16—20 × 9—11 μ. Those measurements, however, certainly included the spore-sculpturing.

SEAVER (1928) united *M. miniata* with *M. chateri* (W. G. SM.) BOUD. (incorrectly spelling the specific epithet *„Charteri"*; specific name after J. J. CHATER, the first collector of that species, see W. G. SMITH in Gard. Chron. 1872, p. 9). As clearly demonstrated and beautifully illustrated by Mme. LE GAL (1947), *M. miniata* shows distinctly reticulated spores even before maturity, whereas the spore-sculpturing of *M. chateri* consists of large warts with only few, obsolete anastomoses. It seems well founded to treat them as separate species.

8. Sepultaria arenicola (LÉV.) MASS. — Syn.: *Peziza arenicola* LÉV.

Norwegian records:

Vest-Agder: Lista: The sand dunes at Kviljo, near the Soviet-Russian war monument, Sept. 2. 1952, F.-E. ECKBLAD (O).

Rogaland: Ogna: The sand dunes at Ogna, Aug. 30. 1952, F.-E. Eckblad (O). — Sola: The sand dunes at Sola, Aug. 29. 1952, F.-E. Eckblad (O).

This species will probably prove to be common on sand dunes in Southern Norway. It may be difficult to detect as it is usually buried in the sand, and only appears as a small „hole" in the ground. Andersson (1950) regards it as a facultative sand-fungus, but mentions that it even may grow on or in gravel-walks.

The apothecia are subglobose, becoming cupulate, externally clothed with long, sinuous, septate hairs incrusted with sand. Asci cylindrical, 8-spored. Spores ellipsoid, 21—25×11.5—13.5 μ, smooth, hyaline, usually containing one large oil-drop. Paraphyses slender, slightly enlarged above.

9. Sowerbyella radiculata (Sow. ex Fr.) Nannf. — For synonyms see Nannfeldt 1938.

Norwegian specimen:

Oppland: Fåberg: Nordre Jørstad, Smiuhaugen, Aug. 28. 1950, Olav S. Jørstad (O).

The apothecia are cupulate and stipitate with a thick, hollow stipe which is mostly buried in the ground. The surface is first white, later brownish, and furnished with wavy, septate, blunt, hyaline hairs. The hymenium changes in colour from yellow to brownish. Spores ellipsoid, 12—14.5×6.5—7.5 μ, hyaline, verrucose, mostly biguttulate. The verrucae are often confluent, forming an incomplete network.

A detailed description of this fungus is given by Nannfeldt (1938), who, discussing the delimitation of some difficult groups of operculate *Discomycetes,* established the new genus *Sowerbyella* Nannf., to comprise our species and a second one, viz. *S. unicolor* (Gill.) Nannf. (= *Aleuria unicolor* Gill.). The latter species, known from a few places in Sweden, ought to be searched for in Norway too. It differs i. a. in the brighter colour of the hymenium and the more elongated spores with smaller warts.

10. Thecotheus pelletieri (Crouan) Boud. — Syn.: *Ascobolus pelletieri* Crouan.

Norwegian specimens:

Oslo: Bygdøy Mars 16. 1955, on cow-dung, developed in moist chambers in ten days, leg. F.-E. Eckblad (O).

Apothecia about 1 mm in diameter, growing on dung of various kind. More or less cylindrical in shape, rarely becoming discoid, white or whitish. Asci clavate, 300—350×40—60 μ, 32-spored. Spores ellipsoid, smooth, hyaline, 23—27×13—14 μ, with thick wall. Parafyses filiform.

The very small apothecia of this species are easily overlooked, in fact, they were first thought to be young fructifications of a *Coprinus* sp., which grew on the same substrate. *T. pelletieri* is probably not rare, but easily overlooked. It is readily distinguished by the microscopical characters mentioned above.

LITERATURE

Andersson, O., 1950: Larger fungi on sandy grass heaths and sand dunes in Scandinavia. — Bot. Notiser, Suppl. 2 (2): 1—89.

Blytt, A., 1892: Bidrag til kundskaben om Norges sopparter. II. Ascomyceter fra Dovre, samlede af A. BLYTT, E. ROSTRUP. — Forh. Vidensk.-Selsk. Christiania 1891, No. 9, pp. 1—14.

Cash, Edith K., 1954: Some Discomycetes new to Alaska. — Jour. Wash. Ac. Sci. 44: 44—46.

Eckblad, F.-E., 1953: Helvella acetabulum i Norge. — Blyttia 11: 130—132.

Favre, Jules, 1955: Les champignons supérieurs de la zone alpine du parc national Suisse. — Ergebn. d. wissenschaftl. Unters. d. schweiz. Nationalparks 5: 33: 1—212.

Gelin, Olov E. V., 1938: The distribution in Scandinavia of Plectania protracta (Fries) Gelin, comb. nov. and Plectania coccinea (Scop.) Fuckel. — D. Kgl. Norske Vidensk.-Selsk. Skr. 10 (52): 194—197.

Grelet, L.-J., 1942: Les Discomycètes de France d'après la classification de Boudier. 9. fasc. — Rev. Myc. 7: 3—26.

Gunnerus, J. E., 1766: Flora Norvegica. Pars Prior. — Nidrosiæ.

— 1772: Flora Norvegica. Pars Posterior. — Hafniæ.

Le Gal, Marcelle, 1947: Recherches sur les ornementations sporales des Discomycètes operculés. — Ann. d. Sci. Nat. 11. Sér. Bot. 8: 73—297.

Nannfeldt, J. A., 1937: Contributions to the mycoflora of Sweden. 4. On some species of Helvella, together with a discussion of the natural affinities within Helvellaceae and Pezizaceae trib. Acetabuleae. — Svensk Bot. Tidskr. 31: 47—66.

Nannfeldt, J. A., 1938: Discomyceten Bulgaria globosa Schmied. ex Fr. funnen i Norge. — Naturen 1938: 2—4.

— 1938: Contributions to the mycoflora of Sweden. 5. On Peziza Catinus Holmskj. ex Fr. and P. radiculata Sow. ex Fr. with a discussion of the genera Pustularia Fuck. emend. Boud. and Sowerbyella Nannf. n. gen. — Svensk Bot. Tidskr. 32: 108—120.

— 1949: Contributions to the mycoflora of Sweden. 7. A new winter discomycete, Urnula hiemalis Nannf. n. sp., and a short account of the Swedish species of Sarcoscyphaceae. — Svensk Bot. Tidskr. 43: 468—484.

Rostrup, E., 1904: Norske Ascomyceter i Christiania Universitets botaniske Museum. — Vidensk.-Selsk. Skrifter. I. Math.-naturv. Kl. 1904, No. 4, 1—44.

Seaver, F. J., 1928: The North American Cup-fungi (Operculates). — New York.

Sommerfelt, S. Chr., 1826: Supplementum Florae Lapponicae. — Christiania.

Størmer, Per, 1946: Caloscypha fulgens ny for Norge. — Blyttia 4: 81—82.

Oslo, February 1956.

VARIATIONS IN RESISTANCE OF TRIFOLIUM PRATENSE TO ATTACKS OF KABATIELLA CAULIVORA (KIRCHN.) KARAK.

By K. J. FRANDSEN

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Øtoftegaard, Denmark

Attacks of *Kabatiella caulivora* (KIRCHN.) KARAK. on red clover are occasionally reported in Denmark and complete crop failures have been observed in red clover seed fields. In some cases it was necessary to abandon growing of clover for a time (STAPEL & BOVIEN 1943). Serious attacks have been reported both in Germany and the Netherlands. In the colder areas of North America, the so-called Northern anthracnose caused by *Kabatiella caulivora,* is a major disease of red clover (HANSON & KREITLOW 1953, KREITLOW, GRAHAM & GARBER 1953).

Symptoms, dark brown or black spots, are mainly confined to stems and petioles. The lesions soon inhibit translocation to the superadjacent parts of stem and petiole which causes them to wilt and die. The petioles bend downward as a shepherd's crook (Fig. 2) at the site of the lesion and thus forms the characteristic picture of the di-

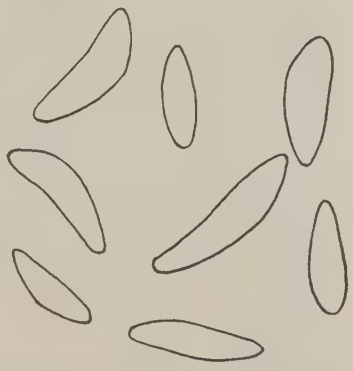

Fig. 1.
Conidia of *Kabatiella caulivora*.
× 1100.

Fig. 2. Plants of red clover *(Trifolium pratense)*. A. Sound plants. B. Plants infected by *Kabatiella caulivora*. Note the characteristically bended stems and petioles.

sease in the field. Lesions on the stem develop as dark spots which lengthen and turn light brown with a dark margin. The stems often crack at the lesions as the plant grows.

Attacks of *Kabatiella caulivora* on red clover have been observed several times in field experiments at Øtoftegaard, Zealand. In 1948 and 1954 our experiments with red clover families were infected with stem disease in the second harvest year. The severity of the attack was judged and expressed in figures (0 = no attack; 10 = severe attack). The figures showed that families differed in resistance to the disease. The severest attack was observed in 1948. Characters (figures) from a red clover test of that year are given. 45 families and 4 strains, one of which served as standard, were sown in 8 series, each with 6 families and the standard. The plot size was 10 sq. meters; the number of replicates 7. The attack was severe in 4 of the series. It was rather evenly spread over the area. The average figure for attack in the standard plots of the 4 series was 4.1, 3.3, 4.0 and 3.7 respectively.

On August 20 characters (figures) were given for degree of attack in all 392 plots.

Analysis of variation of the figures from series 5—8 appears in Table 1 where the 4 series have been treated as one.

Table 1.

Variation in resistance of red clover to attacks of *Kabatiella caulivora*. Øtoftegaard 1948. — Distribution of average figures.

Number of families with average figures:

1.0—1.9	2.0—2.9	3.0—3.9	4.0 4.9	5.0—5.9	6.0—6.9	7.0—7.9	8.0—8.9	9.0—9.9
2	3	7	4	6	0	5	1	0

Analysis of variance:

Variance source:	D. F.	Variance:
Families	27	25.137 ***
Error	168	1.234
Total	195	

It is seen that the family variance is very significant as indicating marked variation within red clover families in resistance to attacks of *Kabatiella caulivora*.

Differences in resistance of the magnitude demonstrated here promise that resistance breeding will be successful. This was actually proved by American clover breeders (Hollowell 1947).

REFERENCES

Hanson, Earle W. & Kermit W. Kreitlow (1953): The many ailments of clover. — U. S. D. A. Yearbook of Agric. 1953: 217—228.

Hollowell, E. A. (1947): More and better clover. — U. S. D. A. Yearbook of Agric. 1943—1947: 427—432.

Kreitlow, K. W., J. H. Graham & R. J. Garber (1953): Diseases of forage grasses and legumes in the Northeastern States. — Penn. State Univ., Coll. Agr., Agr. Exp. Stat. and Reg. Past. Lab. U. S. D. A. Bull. 573: 9—10.

Stapel, Chr. & P. Bovien (1943): Markfrøafgrødernes Sygdomme og Skadedyr. Det kgl. Landhusholdningsselskab, København, p. 29—30.

Taastrup, Denmark, February 1956.

A NEW RHODOTORULA SPECIES, RHODOTORULA MACERANS SP. N., ISOLATED FROM FIELD-RETTED FLAX STRAW

By P. SONNE FREDERIKSEN

Report No. 23 from The Danish Flax Research Institute, Viby J., Denmark.

The processing of fibre plants comprises a microbiological process called "retting". By exposure to moisture the stem tissues are subjected to incipient decomposition, which gives the straw a brittleness enabling the fibres to be extracted mechanically.

In today's Danish flax industry the retting method most widely used is field retting. In connection with pulling (harvesting), the flax is spread out on the ground in thin layers, thus being exposed to the weather conditions. Through moistening by precipitation and dew a condition is established which makes the activities of the micro-organisms possible. Fermentation will take place first in the pectin substances and the water-soluble tissues of the straw and, next, in the actual component of value: the fibre bundle, which consists essentially of cellulose. When rubbing of the straw by hand shows that it has obtained the brittleness desired, it should be removed from the ground and gathered in as soon as it has become sufficiently dry.

LITERATURE

Current literature on field retting and its biology is very sporadic and deals only with some rather commercial aspects and stray floristic studies, which, as far as the author can see, are often founded

on an inadequate "nature-like" basis (retting on sand, in glass dishes, or the like). None of the papers mention at all species of the genus *Rhodotorula* or other species of imperfect yeasts as retting organisms, but RUSCHMANN (1923) decribes the yeasts as "secondary flora" and is of the opinion that they live only on the water-soluble carbohydrates of the straw.

In a paper dealing with the pectin decomposition in dead plants WIERINGA (1955) mentions that he has isolated from field-retted flax straw a *Rhodotorula* species not described before, with pectin fermenting characteristics. He proposes to name this new species *Rhodotorula lini,* but does not give its characteristics. The *Rhodotorula* mentioned by WIERINGA is presumably identical with the one described in the following.

INVESTIGATIONS

In view of the importance of field retting to the Danish flax industry, The Danish Flax Research Institute has for several years been carrying on systematic investigations of the species of this retting method at different times of the year and tried, through simultaneous practical retting experiments, to deduce some

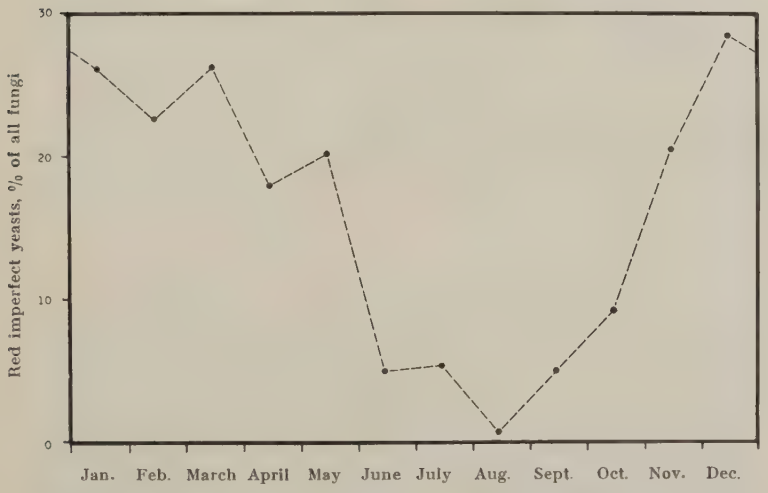

Fig. 1. Occurrence of red imperfect yeasts on field-retted flax straw. Investigations over 6 years.

connection between the retting flora and the quality of the retting[1]). These investigations — spread over 6 years — demonstrated that the group of "red imperfect yeasts" amounts to about 30% of the mycological flora[2]). Isolation and determination of 38 isolates of these red yeast colonies revealed that 95% of all the isolates could be referred to the genus *Rhodotorula.*

The occurrence of *Rhodotorula* species on the retted flax straw varies with the season as shown in Fig. 1. The yeasts are most frequent in the moist and cold season and may in certain spells of winter reign supreme within the mycological flora jointly with species of *Cryptococcus.* While the moulds are exterminated by the low temperatures of winter, the yeasts will spread in consequence of the higher humidity of the atmosphere, the soil and the flax straw. These microorganisms then give rise to the winter field retting the eminent quality of which is well known from practical and experimental field retting in the cold season.

Investigations of altogether 36 isolates of *Rhodotorula* according to LODDER & VAN RIJ ("The Yeasts" 1952) proved that 9 isolates, or 25%, could be referred to *Rhodotorula glutinis,* while 27 isolates, or 75%, might be regarded as a new species. This *Rhodotorula* species, whose description is given below, consequently constitutes the major proportion of the red imperfect yeasts on field-retted flax straw and is therefore a microorganism which is very valuable for flax retting. It represents 15—20% of the mycoflora of field retting in the six winter months. It is proposed to name this new species *Rhodotorula macerans,* af-

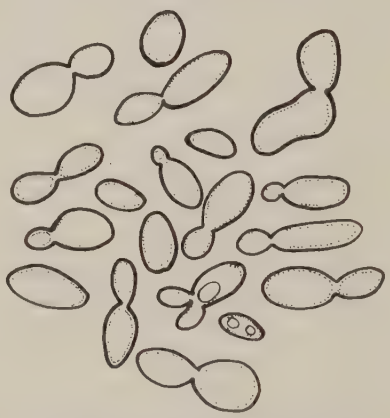

Fig. 2. Cells of *Rhodotorula macerans* sp. n. after 3 days in malt extract.

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[1]) A detailed account of these investigations will be published later.

[2]) Samples of the retted flax straw were cut up by shaking with glass balls in sterile water. The author realizes that the moulds have thereby become more numerous because of the cutting-up of the mycelium. Considering that the retting organisms live in the flax straw, the method is still regarded as necessary and correct. Spreading of the shaking-water after dilution was done on malt-agar.

ter the retting process. Probably, this species occurs commonly on dead plants in nature, and not exclusively on flax[1]).

Rhodotorula macerans sp. nov.

Cultura in extracto malti: Post 3 dies ad 25° C cellulae sunt oblongo-ovales (3.3—5.5×7—12 μ), singulae vel binae. (Fig. 2). Post unum mensem ad 17° C sedimentum atque annulus formati sunt.

Cultura in malto-agar: Post 3 dies ad 25° C cellulae sunt oblongo-ovales (3—5×7—12 μ), singulae vel binae. Cultura in striis post unum mensem ad 17° C laevis et nitens est vel ex parte rugosa et opaca, color roseus vel ruber.

Cultura in lamina vitrea: Nullum pseudomycelium.

Fermentatio: Nulla.

Assimilatio sacchari: Glucosis +
Galactosis + (exigua)
Saccharosis +
Maltosis +
Lactosis + (saepe exigua).

Assimilatio kaliumnitrati: Adest.

Ethanoleum ut unica origo carbonis: Nullum incrementum.

Decompositio arbutini: Variabilis.

Cultura in pectino: Incrementum observatur.

Productio compositorum amylo similium: Adest.

Culturae huius speciei conservantur in "Centralbureau voor Schimmelcultures", Delft, Hollandia, item in collectionibus culturarum fungorum, quas Academia regia agriculturae, pars phytopathologica, in Hafnia sustentat.

Standard description of *Rhodotorula macerans* sp. n.

Growth on malt extract: After 3 days at 25° C, cells are oblong-oval (3.3—5.5×7—12 μ), single or in pairs (Fig. 2). After one month at 17° C a sediment and a ring are formed.

Growth on malt-agar: After 3 days at 25° C, cells are oblong-oval (3—5×7—12 μ), single or in pairs.

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1) The specific name *"lini"* (after the flax plant) ought not to be used for this saprophytic yeast but should be reserved to the pathogene fungi of the flax plant.

The streak culture after one month at 17° C is smooth and shiny or partially rugose and dull; the colour is pink to red.

Slide cultures: No pseudomycelium.

Fermentation: Absent.

Sugar assimilation: Glucose +
Galactose + (weak)
Saccharose +
Maltose +
Lactose + (often weak).

Potassium-nitrate assimilation: Positive.

Ethanol as sole source of carbon: No growth.

Splitting of arbutin: Variable.

Growth on pectin: Positive.

Production of starch-like compounds: Positive.

Cultures of the abovenamed species are kept in "Centraalbureau voor Schimmelcultures", Delft, Holland, and in the collection of fungus cultures in the Plant Pathological Department of The Royal Veterinary and Agricultural College, Copenhagen.

DISCUSSION

Testing with LUGOL'S iodine solution in accordance with LODDER & VAN RIJ'S description gave a distinct blue colour at all the cultures, which shows that the cells of *Rhodotorula macerans* contain compounds of a starch-like nature. This character is one of the most important characters of the species.

Fig. 3. Slide cultures of *Rhodotorula macerans* sp. n. after 10 days.

Rh. macerans assimilates nitrate and thereby resembles *Rh. glutinis,* which is found on field-retted flax straw, too, and, according to LODDER & VAN RIJ (1952), also produces starch-like compounds. In relation to sugar species *Rh. macerans* differs from *Rh. glutinis* in the capacity for assimilation of lactose. The new species assimilates sugar species in the same way as *Rh. flava,* but is easily discerned from the latter by the yellow colour of its streak culture and by its reaction as to nitrate and iodine. These

characters are sufficient to distinguish *Rh. macerans* from the *Rhodotorula* species described by LODDER & VAN RIJ in "The Yeasts" (1952).

ACKNOWLEDGMENTS

The author offers his best thanks to DRA. W. CH. SLOOT, "Centraalbureau voor Schimmelcultures", Delft, Holland, for investigations of two cultures of the abovenamed *Rhodotorula* species and for the opinion that it is a new species. Also to Dr. K. T. WIERINGA, Laboratorium voor Microbiologie de Landbouwhogeschool, Wageningen, Holland, the most sincere thanks are due for having been so kind as to forward the cultures to the "Centraalbureau voor Schimmelcultures" and, besides, assisted me in my work with the field-retting flora.

In the preparation of the manuscript I have had valuable assistance from Professor N. FABRITIUS BUCHWALD. Mr. E. BROCKMEYER has been so kind to prepare the Latin diagnosis. I acknowledge with gratitude the help rendered me by these two gentlemen.

BIBLIOGRAPHY

Lodder, J. & Kreger-van Rij, N. J. W., 1952: The Yeasts. 713 pages, 268 figures. Amsterdam.

Ruschmann, Gerhard, 1923: Grundlagen der Röste. 188 pages, 27 figures. Leipzig.

Wieringa, K. T., 1955: Der Abbau der Pektine; der erste Angriff der organischen Pflanzensubstanz. Zeitschrift für Pflanzenernährung, Düngung und Bodenkunde 69: 150—155.

Viby J., Denmark, February 1956.

PARMELIA SUBAURIFERA Nyl. AND P. FRAUDANS (Nyl.) Nyl. IN GREENLAND

By PAUL GELTING

An auto trip on the sea ice along the S. coast of Disko Isl., W. Greenland, gave me on February 23, 1950 the opportunity of studying the lichens at Engelskmandens Havn. For the vegetation at the stenothermous springs here, keeping a temperature of ca. + 17° C, see Porsild (Medd. om Grønl. 25, 1902, 181, & ibid. 60, 1921, 313).

On the day of my visit the air temperature was ca. ÷ 25° C, and the main stream of the springs ran unhampered into the sea. The easternmost spring, which in summer irrigates a meadowy stand of *Juncus arcticus* rich in *Habenaria hyperborea,* was frozen. Consequently I could lay down with my back on the frozen spring and study the lichens growing on the lower side of the large gneiss blocks forming almost a cave over the spring.

The roof of the cave was partially covered by rime and ice, evidently formed when the spring was still flowing. In the crust of sterile and leprarioid lichens I could determine: *Cetraria hepatizon, Parmelia saxatilis, P. subaurifera, Peltigera scutata* and *Physcia grisea.* On the top of the blocks outside the cave grew: *Cetraria commixta, Parmelia disjuncta, P. fraudans* and *P. sulcata.*

In the following some data are given about *Parmelia subaurifera* and *P. fraudans,* the first never, the second rarely recorded from the Arctic. Microtome sections studied, 5 and 10 μ thick. Field numbers are cited in paranthesis after the collecting places.

The material was partly worked up at the Arctic Station, Godhavn, W. Greenland, partly at the Institute of Systematic Botany of the University of Uppsala (UPS). To Professor J. A. Nannfeldt and his staff, especially Docent Rolf Santesson, I express my cordial thanks. Fil. lic. T. E. Hasselrot, curator at the Riksmuseum, Stockholm (S), has kindly confirmed my determinations of *Parmelia fraudans.*

1. Parmelia subaurifera Nyl.

in Flora, 56, 1873, 22. Zahlbruckner, Catal. 6, 1930, 117. Tavares 1945, 78. Maas Geesteranus 1947, 126.

Icon.: Galløe 1948, Pl. 35 & 36, figs. 230—247.

Exs.: Claud. 121; Elenk. 153; Flag. Fr. C. 110; Krypt. Vind. 1872; Malme 135; Norrl. 31; Oliv. 12; Roum. 405; Zw. 525, 865; Krawiec 82; Suza 145. All seen in UPS.

W. Greenland: Godhavn, Engelskmandens Havn, cave (cf. p. 241), 3—4 m. s. m. (10689, 12709).

Specimens 1—2 cm in diam., upper surface yellowish brown. Isidial soredia numerous, typical; as young yellowish, in age whitening. Lower surface black to brown, rhizinose.—Apothecia absent.

Thallus 90—160 μ thick. Upper cortex 6—10 μ thick, brown, formed of one layer of firmly coherent cells (as in Galløe l. c., fig. 242). Medulla up to 120 μ thick, white, forming an open tissue, C + red. Hyphae 4—6(9) μ, membrane 1 μ thick, at intervals covered by white granules, giving the hyphae a woolly appearance (as in Galløe, fig. 246). Lower cortex 6—8 μ thick, brown, formed of one cell-layer (as in Galløe, fig. 243). Algae globoid, 8—14 μ, light green, cystococcoid, forming a thin, ± open layer below upper cortex. Description after 12709.

The specimens recall N. Fennoscandian ones and may be referred to the main species (cf. Maas Geesteranus l. c.).

Habitat: The lichen crust, in which *Parmelia subaurifera* takes part, is slightly dusty. The presence of *Physcia grisea* (interwoven with *P. subaurifera)* indicates the dust to be rich in nutritive matter. The dust may originate from droppings of the snow-buntings visiting the cave, or from the disintegrating "tufa" layers surrounding the gneiss area at Engelskmandens Havn.

The spring breaks early and freezes late. It ameliorates in several respects the summer climate of the cave in diminishing the temperature oscillations and augmenting the aerial humidity.

The roof of the cave receives light reflected from the snow outside, which persists for a long time after the spring has broken through. It also receives light reflected from the spring itself running the whole vegetation period. Light reflected from the snow is of great importance in the Arctic and of particular influence in spots not reached by the sun. This may illustrate how *P. subaurifera* and other species can sustain life in a cave never receiving direct sunlight. The locality is far N. of the previously known distribution of the species

and represents so far the sole known Arctic record. Within its main area in more southern climes, *P. subaurifera* is mostly an epiphyte of trees.

Geographical distrib.: Greenland (cf. p. 242). — Europe: From Finnmark, Swedish, Finnish and Russian Lapponia through all European countries to the Mediterranean (Spain, Italy, Dalmatia, Greece). Crimea: Jalta, leg. DEGELIUS (Herb.); Caucasus. From Ural: Molotov (Perm), pr. pag. Oborino, leg. A. OXNER (UPS), to Scotland and the islands W. hereof: Isl. of Mull, leg. P. O. LINDAHL (UPS). Ireland; Bretagne; Portugal. In S. E. Europe mainly montane. — N. Africa: Morocco; Algeria. — Asia: Middle Ural; Konda; Minusinsk. At the Ob: Kalinsk, 61° N. lat., leg. M. BRENNER (S); at the Yenisej: Yenisejsk, Stolba and Uskij mys, 61° 27' N. lat., leg. M. BRENNER (S). China: Kansu, Tsagaling, on *Picea* and *Betula,* 1900—2200 m. s. m., leg. D. HUMMEL (S). — N. America: U. S. A.: Maine, Mt. Desert Isl., leg. G. LLANO (UPS); Connecticut; New York; Tennessee; Michigan; Wisconsin: Lincoln co., leg. J. W. THOMSON (2438, UPS); Minnesota. Canada: Nova Scotia, Cape Breton Isl.; Ontario: Bear Isl., leg. R. F. CAIN (21738, UPS); British Columbia: Vancouver Isl., leg. J. MACOUN (UPS). — I have seen no records from Asia Minor, E. Asia and western U. S. A.

2. Parmelia fraudans (NYL.) NYL.

in NORRLIN, Not. Sällsk. F. Fl. Fenn. Förh. 13, 1871, 324; ZAHLBRUCKNER, Catal. 6, 1930, 166; LYNGE 1921, 171; HASSELROT 1953, 80. — *P. saxatilis* **P. fraudans* NYL., Lich. Scand. 1861, 100 & Lich. Lapp. Orient. 1866, 119.

Icon.: Fig. 1, p. 244.

Exs.: HAV. 557; Krypt Vind. 1970; MALME 556; NORRL. 25; RÄS. 45, 46.

W. Greenland: Upernivik: Pâ. Disko: Diskofjord, basalt block at trading post; Godhavn, Engelskmandens Havn, gneiss block 4—5 m. s. m. (10688); Lyngmarken, gneiss block in *Salix* copse, 20 m. s. m. (12719, 18573a). Egedesminde: Arfersiorfik Fjord: Serfartok Isl., low gneiss block in *Betula nana* heath, 15 m. s. m. (16538); Agpakarfik, N. exp. gneiss rocks with *Lobaria scrobiculata,* 30 m. s. m. (16236a-b); Ordlerfik, low gneiss blocks near bird place, 8 m. s. m. (16061b). All collected by GELTING. The first find of this species in Greenland was made by M. SKYTTE CHRISTIANSEN in 1946 at Holsteinsborg: Head of S. Strømfjord (kind verbal communication).

Specimens up to 8 cm, occasionally 12 cm in diameter. Upper surface darker or lighter greyish, often with a yellow tinge. Soredia

typical, frequently elevated on an isidioid base; as young limbiform (DU RIETZ 1924, 379), in age ± confluent (Fig. 1, p. 244). Lower surface black to brown, rhizinose. — Apothecia absent.

Thallus 150—260 μ thick; upper surface covered by a 4—5 μ thick, uncoloured, necral stratum. Upper cortex 20—36 μ thick, paraplect-

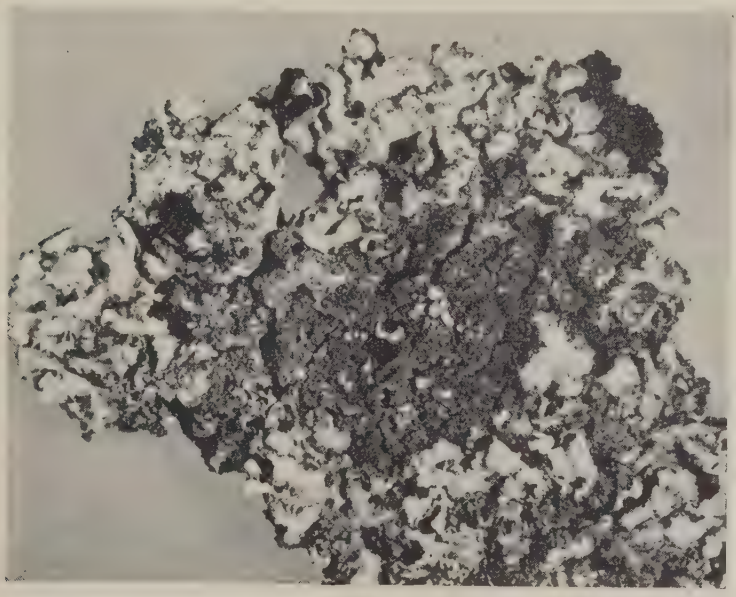


Fig. 1. *Parmelia fraudans* (NYL.) NYL. Specimen from Agpakarfik (16236 a). SVEN ERIKSSON (Växtbiol. Inst.) phot. ×2.

enchymatous, uncoloured or greyish; at middle enlargements seemingly divided in an upper darker and a lower lighter stratum. Cortical cells 4—6 in number, membrane not particularly thick. Medulla 40—150 μ thick, whitish, forming an open tissue, C—, K+ yellow-red; hyphae 2—3(4) μ thick, leptodermatic; membrane 0.5—0.8 μ thick. Lower cortex 8—30 μ thick, paraplectenchymatous, brown; cells 3—4(5) in number, mesodermatic. In the apices of the lobes a brownish stratum with ± coherent cells is found between lower cortex and medulla. It is found also in the interior of the rhizinae. Algae globoid, 6—15 μ in diam., cystococcoid, forming a layer, 30—90 μ thick, below upper cortex. Description after 18573a.

NYLANDER (Flora 52, 1869, 292) doubted the value of his subspecies, but raised it to a specific rank 1871. *Parmelia fraudans* deviates from *P. saxatilis* in bearing soredia, from *P. sulcata* in the form and arrangement of the soredia. The Greenland specimens belong to the main species.

Parasites: *P. fraudans* is often overgrown by dark hyphae. In 18573a from Lyngmarken the hyphae bear spinulose apothecia belonging to *Echinothecium reticulatum* ZOPF.

Habitat: In the interior of Upernivik and Egedesminde districts *P. fraudans* is mainly found in the vicinity of bird places (eiderducks, ptarmigans, snow-buntings), however, not on the more intensely dunged rocks. At Ordlerfik the larger stones visited by ptarmigans were inhabited by: *Physcia dubia, Umbilicaria decussata, Xanthoria candelaria, Lecanora rubina, Rinodina cacuminum, R. oreina* a. o., while *P. fraudans* was not found. In the vicinity, however, it occurred abundantly on low stones together with ± mesotrophic species as: *Alectoria pubescens, Cetraria hepatizon, P. saxatilis* a. o..

On a block slightly influenced by snow-buntings it occurred at Lyngmarken together with: *Parmelia disjuncta, P. saxatilis, P. intestiniformis, Sphaerophorus globosus, Umbilicaria hyperborea, Crocynia neglecta, Lecanora polytropa* and *Rhizocarpon geminatum;* in the main a mesotrophic to slightly eutrophic community. In Fennoscandia *P. fraudans* is (HASSELROT, 1953, 82) in some degree favoured by human agency and becomes especially towards S. an apophyte.

As in Fennoscandia, *Parmelia fraudans* is also in Greenland most frequent in the inland. Godhavn and Diskofjord are the localities, where the species occurs nearest the open sea.

Geographical distrib.: Greenland, W. coast 66°—73° N. lat. — Europe: Mainly Fennoscandian. From Finnmark, Swedish, Finnish and Russian Lapponia S. to Oslo, Småland, Gulf of Finland, Karelian Isthmus, Leningrad, Ladoga- and Olonetz Karelia. Recorded from Novaya Zemlya, Tallin and Tartu. Caucasus. — N. America: Miquelon. Canada: Keewatin, Repulse Bay. Alaska: N. coast, Camden Bay.

In addition an unlocalized record (ECKFELDT 1895, 243) from Labrador or from New Foundland.

RESUMÉ

Parmelia subaurifera rapporteres for første gang fra Grønland, hvor den er fundet i en grotte ved de „varme" kilder i Engelskmandens Havn ved Godhavn. *Parmelia fraudans* angives fra adskillige

steder paa vestkysten indtil 73° n. br. Hos begge arter beskrives thallus-bygningen (apothecier fandtes ikke), ligesom der gives oplysninger om voksestedsbetingelser og geografisk udbredelse. Som parasit paa *P. fraudans* optræder i Godhavn *Echinothecium reticulatum,* der ikke tidligere er angivet fra Grønland.

LITERATURE

Ahlner, S.: Flechten aus Nordfinnland. — Ann. Bot. Soc. Zool. Bot. Fenn. Vanamo, 9, 1. Helsinki 1937.

Arnold, F.: Lichenologische Fragmente, 29, Miquelon. — Flora 71. Regensburg 1888.

Burnham, S. H.: Lichens of Lake George. — Bryologist 25. Pittsburgh 1922.

Degelius, G.: Contributions to the Lichen Flora of N. America I-II. — Ark. f. Bot. 30 A, 1 & 3. Uppsala 1940—41.

Dubrovsky, G. I.: Notulae ad floram lichenum reservati "Stolby" regionis Krasnojarsk. — Not. Syst. Crypt. Inst. Bot. Komarovii. Acad. Scient. URSS. 9. Moskva 1953.

Du Rietz, G. E.: Die Soredien und Isidien der Flechten. — Sv. Bot. Tidskr. 18. Uppsala 1924.

Eckfeldt, J. W.: An Enumeration of the Lichens of New Foundland and Labrador. — Bull. Torrey Bot. Club. 22, 6. Lancaster, Pa. 1895.

Evans, A. W. & Meyrowitz, R.: Catalogue of the Lichens of Connecticut. — Conn. State Geol. Nat. Hist. Surv. Bull. 37. Hartford 1926.

Flagey, C.: Catalogue des Lichenes. — Battandier & Trabut: Flore de l'Algérie, 2. Alger 1896—1897.

Galløe, O.: Natural History of the Danish Lichens. 7. Copenhagen 1948.

Gattefossé, J. & Werner, R. G.: Catalogus Lichenum Marocanum. — Bull. Soc. Sci. Nat. Maroc. 11. Rochefort-sur-mer 1931.

Hasselrot, T. E.: Nordliga lavar i Syd- och Mellansverige. — Act. Phytogeogr. Suecica 33. Uppsala 1953.

Lamb, I. M.: Lichens of Cape Breton Island, Nova Scotia. — Ann. Rept. Nat. Mus. Canada 1952—53, Bull. 132. Ottawa 1954.

Lynge, B.: Studies on the Lichen Flora of Norway. — Vid. Selsk. Skr. I. Mat. Nat. Kl. 1921, 7. Kristiania 1921.

— : Lichens from Novaya Zemlya. — Rep. Norw. Exp. N. Z. 1921, 43. Oslo 1928.

— : A contribution to the Lichen Flora of Canadian Arctic. — Publ. Catholic Univ. America, Washington, D.C. 1939.

Maas Geesteranus, R. A.: Revision of the Lichens of the Netherlands. I. Parmeliaceae. Leiden 1947 (Diss.).

Magnusson, A. H.: Lichens from Torne Lappmark. — Ark. f. Bot. 2, 2. Uppsala 1952.

Merrill, G. K.: Lichens Collected by the Canadian Arctic Exp. 1913—18. — Rep. Can. Arct. Exp. 1913—18, 4. Ottawa 1924.

Nichols, G.: Lichens of Douglas Lake. — Bryologist 28. Pittsburgh 1925.

Räsänen, V.: Die Flechten Estlands I. — Ann. Acad. Sci. Fenn., Ser. A. 34, 4. Helsinki 1931.

Tavares, C. N.: Contribuïção para o Estudo das Parmeliáceas Portuguesas. — Portug. Acta Biol., Sér. B, I. Lisboa 1945 (Diss.).

Thomson, J. W.: Lichens from the Keweenaw Peninsula. — Bryologist 54. Pittsburgh 1951.

Vainio, E.: Lichenes in Sibiria meridionali collecti. — Act. Soc. F. Fl. Fenn. 13. Kuopio 1896.

— : Lichenes in Caucaso et in peninsula Taurica ab H. Lojka et M. a. Déchy collecti. — Természetrajzi Füzetek, 22. Budapest 1899.

— : Enumeratio Lichenum in viciniis fluminis Konda in Sibiria occidentali crescentium. — Ann. Acad. Sci. Fenn., Ser. A. 27. Helsinki 1928.

Zopf, W.: Untersuchungen über die durch Pilze hervorgerufenen Krankheiten der Flechten. — Nov. Act. Acad. Leopold. Carol. Germ. Nat. Cur. 70. Halle 1898.

Uppsala, February 1956.

RUSTSOPPER OG RUSTVERTER NYE FOR FÆRØERNE

Av ASBJØRN HAGEN

Under studier av arktiske planter i Botanisk Museum i København så jeg også leilighetsvis over en del planter fra Færøene og gjorde herunder noen funn av mykogeografisk interesse.

En historikk over den mykologiske utforskning av Færøene er gitt av MØLLER (1945, s. 11—13). MØLLER's meget vakre avhandling samt ROSTRUP's liste (ROSTRUP 1901, s. 304—316) er de to arbeider hvori vår viten om Færøenes rustsopper er samlet.

Hva vertplanter for *Puccinia hieracii* angår, anfører ROSTRUP (1901, s. 307) bare *„On Hieracium"*, og MØLLER (1945, s. 101—102) nevner *Hieracium caesium* FR. og *H. vulgatum* FR. Da både H. DAHLSTEDT og S. O. F. OMANG har revidert de færøiske hieracier i København-museet, ønsket jeg å se over disse, og jeg fant en del nytt materiale m. h. t. rustangrep på de forskjellige småarter. Det verdifulle rustsoppmateriale som ble tilveiebragt på denne måte, ble selvsagt til dels sparsomt, og jeg foretok derfor med en gang omhyggelige sporemålinger (i 50% melkesyre), og har på grunn av materialknappheten oppbevart også preparatene.

1. Chrysomyxa empetri (PERS.) SCHROET.

På *Empetrum hermaphroditum* (LGE.) HAGERUP. Haugen ved Thorshavn, II, 12.6.1927; leg. FR. SVENDSEN (uredosporer 28.5-38 (46) × 23-28.5 μ). — *Chrysomyxa empetri* er ny for Færøene, men er kjent f. eks. fra Island (JØRSTAD 1952, s. 10—11, 85), Norge, Skottland, Vest- og Øst-Grønland (HAGEN 1952, s. 97) og Ø.- og V.-Nordamerika.

2. Puccinia arenariae (Schum.) Wint.

På *Sagina procumbens* L. Thorshavn: Høivikshauge, 23.7.1934; leg. Levi Rygg (teleutosporer 30-52×14-17 μ, apikal fortykkelse opptil 6.5 μ, noen sporeskaft målte mellem 50 og 76.5 μ). — Denne rustsopp fant jeg under studier av færøiske planter i Botanisk Museum, Oslo, og den oppbevares her. *Puccinia arenariae* er ny for Færøene, men er funnet en gang på *Sagina procumbens* (og bare på denne vertplante) på Island. Jørstad (1952, s. 25) skriver om denne rustsopps forekomst på Island: „Evidently this rust is very rare in Iceland. *S. procumbens* is quite common, and although I regularly investigated this species carefully, I never succeeded in finding the rust."

3. Puccinia hieracii Mart.

På *„Hieracia cerinthoidea"*, det. H. Dahlstedt, av Rostrup bestemt til *H. murorum* L. Strømø: Sandegjærde, II+III, 31.7.1867; leg. E. Rostrup (uredosporer 25.5-33×22-27 μ; teleutosporer 26-37.5× 19-22.5 (26.5) μ).

På *Hieracium constrictiforme* Dahlst. *(Vulgata genuina)*. „Insula Suderø, in rupibus ad Vaag, alt. m. 25, 10.8.1895, No. 757; leg. H. G. Simmons; det. H. Dahlstedt", II+III (uredosp. 25-27×20.5-24.5 μ, teleutosp. 24-35.5×19-23 μ). Strømø, „ved Bygden Kvalvik", (II)+III, 21.9.1925; leg. Lemche; det. S. O. F. Omang (uredosp. ytterst sparsomme i prøven, gamle 26×25 μ; teleutosp. rikelig, 22-34.5×18.5-24 μ).

På *H. epileucoides* Dahlst. *(Rigida)*, Dahlstedt 1903, s. 639—640; av Omang kalt *H. simmonsianum* Dahlst. var. *epileucoides* Dahlst. (Ostenfeld & Grøntved 1934, s. 154). Strømø: hammer ved Torsvig, II+III, 21.8.1897; leg. J. Hartz & C. H. Ostenfeld (uredosp. 24.5-30.5×19.5-27 μ; teleutosp. 25-38×19-27 μ).

På *H. faeroënse* Dahlst. *(Rigida)*. Suderø: Frodebø, II+(III), 7.8.1867; leg. E. Rostrup (prøvene inneholdt så å si bare uredosporer: 22-29.5×19-26 μ, og ytterst få teleutosporer: 34×20 μ). Frodebø, II+III, 19.7.1897; leg. J. Hartz & C. H. Ostenfeld (uredosp. 22-28.5× 21-25.5 μ; teleutosp. 27-40.5×19-22 μ). Thorshavn: skrænt ved Sandegjærde, II+III, 30.8.—5.9.1903; leg. C. H. Ostenfeld (uredosp. 22.5-29.5×22-26.5 μ; teleutosp. 27-38×19-24.5 μ).

På *H. gnophodes* Om. *(Cerinthoidea)*, det. S. O. F. Omang (av H. Dahlstedt bestemt som *H. leucograptum* Dahlst.). Strømø: Højvig, „in grassy hillslopes in the lowland", II+III, 29.8.1903; leg. C. H.

OSTENFELD (uredosp. 25.5-28.5×21.5-24.5 μ; mest av teleutosporer: 26-38 (48)×16-26 μ).

På *H. kalsoënse* DAHLST. *(Cerinthoidea)*. Kalsø: Mygledal, II+(III), 5.8.1897; leg. J. HARTZ & C. H. OSTENFELD (uredosp. 24-29.5×18.5-27 μ; i prøven bare noen få teleutosporer: 28.5×19.5-24.5 μ).

På *H. peramplum* DAHLST. *(Cerinthoidea)*. Østerø: hammer ved Troågjov nord for Svinå, II+III, 12.8.1896; leg. C. H. OSTENFELD (uredosp. 26-30×19-24.5; teleutosp. 27-37×19-24.5 μ). Suderø: Trangisvåg, oppskyllet floddelta, II+III, 18.7.1897; leg. J. HARTZ & C. H. OSTENFELD (uredosp. i flertall i prøven: 23.5-27.5×17.5-24 μ; teleutosp. 24.5-30.5×19-25.5 μ). Thorshavn, „in grassy, fairly dry places near the rivulet," II+III, 29.8.1903; leg. C. H. OSTENFELD (i prøven uredosp. i flertall: 24-36×18.5-24 μ; teleutosp. 27-30×19-24 μ).

På *H. sarcophylloides* DAHLST. *(Silvatica)*. Østerø: Kodlen nær Eide, 400 m o. h., II+III, 17.8.1895; leg. H. G. SIMMONS (uredosp. 25.5-28.5×19-24.5 μ; teleutosp. 23-35.5×19-23 μ).

På *H. scoticiforme* DAHLST.*(Rigida)*. „Insula Suderø, in rupibus ad Vaag," II+III, 10.8.1895; leg. H. G. SIMMONS (uredosp. 23.5-27.5×20.5-25 μ; teleutosp. (23) 29-35.5×18-21 (24.5) μ). Strømø: Kirkebø, II+III, 18.8.1897; leg. J. HARTZ & C. H. OSTENFELD (uredosp. 24.5-31.5×19-24.5 μ; teleutosp. 27.5-33.5×19.5-24.5 μ). Strømø: Højvig, „in grassy, fairly dry slopes near the sea", (II)+III, 29.8.1903; leg. C. H. OSTENFELD (uredosp. i prøven sparsomt: 25-32×20.5-25.5 μ; teleutosp. 28.5-41×16.5-24 μ). Strømø: Kirkebø, II+III, 10.8.1913; leg. J. JEPPESEN (uredosp. 23-25.5×21-24 μ; teleutosp. 22-34(38)×18.5-26.5 μ).

På *H. subrubicundum* DAHLST. *(Cerinthoidea)*. „No. 755. Ad „Karagjov" prope Qualbø insulae Suderø. Alt. m. 100", II, 7.8.1895; leg. H. G. SIMMONS (sparsomt materiale, uredosp. 22-27.5×18-24.5 μ). Suderø: på en hammer ved Trangisvåg, II+III, 17.8.1895; leg. C. H. OSTENFELD (uredosp. 24.5-26×22-24.5 μ; teleutosp. dominerte i prøven: 27.5-41.5×18-23(31.5) μ). Østerø: hammer ved Troågjov nord for Svinå, II, 12.8.1896; leg. C. H. OSTENFELD (bare uredosp. i prøven: 23-29.5×19-26 μ). Bordø: Holgafjæld, 475 m, II+III, 16.8.1897; leg. J. HARTZ & C. H. OSTENFELD (overveiende uredo i prøvene, til dels gammel, uredosp. 26-30×(16.5)18.5-26.5 μ; teleutosp. 27-35×19-22 μ).

På *H. subvarians* ZAHN, syn. *H. heterophyllum* DAHLST. *(Cerinthoidea)*. Kunø: Haugen ved Haraldssund, II+III, 4.8.1897; leg. J. HARTZ & C. H. OSTENFELD (uredosp. 22-32.5×19.5-24.5 μ; teleutosp. 24-33×18.5-25 μ).

På *H. veterascens* DAHLST. *(Cerinthoidea)*. „No. 475. Ad Mølen prope Eide insulae Østerø", II+III, 19.8.1895, leg. H. G. SIMMONS (uredosp. 24.5-27.5×19-21.5 μ; teleutosp. 30-39×18-24 μ). Østerø: Næs- Reuk, på en hammer, II+III, 20.8.1897; leg. J. HARTZ & C. H. OSTENFELD (uredosp. 23-27.5×19.5-24.5 μ; teleutosp. 27.5-37×19-24 μ).

På *H. veterascens* DAHLST. var. *eidense* DAHLST. Østerø: Mølen ved Eide, II+III, 19.8.1895; leg. H. G. SIMMONS (No. 11 og No. 461; uredosp. 22.5-28.5×19-27 μ; teleutosp. 25-31.5×18-22(28) μ).

Sett under ett blir sporemålene for det her undersøkte materiale av *Puccinia hieracii:* 22-33(36)×(16.5)17.5-27 μ for uredosporenes vedkommende og 22-41.5(48)×16-28(31.5) μ for teleutosporene.

Det fremgår av ovenstående at mange av de angrepne arter tilhører den vest-europæiske artsgruppe *Cerinthoidea* (OMANG 1949); av tilsammen 25 prøver tilhørte de 14 *Cerinthoidea,* 8 *Rigida,* 2 *Vulgata genuina* og 1 *Silvatica.*

SUMMARY

Two rusts and several host plants of Puccinia hieracii new to the Færöes.

In this small annotated list of rust specimens from the Færöes *Chrysomyxa empetri* and *Puccinia arenariae* are new species to the rust flora of the islands. A number of *Hieracium* species (identified by the specialists H. DAHLSTEDT and S. O. F. OMANG) are new Færöese host plants of *Puccinia hieracii.* Accurate spore measurements are given for each specimen.

LITTERATUR

Hagen, A.: Neue Beiträge zur arktischen Pilzflora. Ber. Deutsch. Bot. Ges. 65: 97—100. 1952.

Dahlstedt, H.: The Hieracia from the Færöes. Botany of the Færöes. Part II: 625—659 and Plate XI, XII. Copenhagen 1903.

Jørstad, I.: The Uredinales of Iceland. Skr. utgitt av Det Norske Vidensk.-Akad. i Oslo, I, 1951, 2: 1—87. 1952.

Møller, F. H.: Fungi of the Færöes. Part I. Basidiomycetes. Copenhagen 1945.

Omang, S. O. F.: Cerinthoidea, et nytt element i den norske Hieraciumflora. Blyttia 7: 8—12. 1949.

Ostenfeld, C. H. & J. Grøntved: The Flora of Iceland and the Færöes. Copenhagen 1934 (Hieracium by S. O. F. Omang, pp. 146—168).

Rostrup, E.: Fungi from the Færöes. Botany of the Færöes. Part I: 304—316. Copenhagen 1901.

Oslo, Januar 1956.

TWO POLYPORACEOUS FUNGI WITH MERULIOID HYMENOPHORE

PORIA TAXICOLA (PERS.) BRES. AND POLYPORUS DICHROUS FR. EX FR.

By LISE HANSEN

One of the distinguishing characters between *Meruliaceae* and *Polyporaceae* is that the hymenium in the *Meruliaceae* is formed before the tubes develope and thus cover the edges of the dissipiments. A small group in the genus *Poria* shows this merulioid character, combined with normal polyporoid features such as rather deep and regular pores. This group, which contains the species *Poria taxicola* (PERS.) BRES., *Poria violacea* FR., and *Poria purpurea* FR., has been placed by several authors in a merulioid group of *Poria* and recently elevated to generic rank as *Merulioporia* by BONDARZEW & SINGER (1941). *Merulioporia* is characterized by a soft pellicular, resupinate fruit body and the hymenophore is at first folded reticulate, then tubular, with edges of the tubes covered by basidia. The hyphae have no ampullae and no clamp connections, and the spores are cylindrical.

During anatomical investigations on *Polyporus dichrous* FR. ex FR. it was found that this fungus shows merulioid characters too, in having fertile edges on the dissipiments. It hence appears that this merulioid character can be found in different groups of *Polypores,* which are not normally classified together. The genus *Merulius* s. l. itself has been divided into two genera: *Serpula* (PERS.) S. F. GRAY with brown spores, and *Merulius* FR. with hyaline spores. Even this last group seems heterogenous, combining species with distinctly allantoid spores and coloured hymenium and species with ellipsoid or cylindric spores and pale or white hymenium.

The Botanical Museum of the University of Copenhagen holds a few collections of *Poria taxicola,* and more collections are found in the Herbarium of the Department of Plant Pathology, Royal Vetr. and Agric. Coll., Copenhagen. There are one collection of *Polyporus dichrous* in the Botanical Museum, and two collections in the Department of Plant Pathology, Royal Vetr. and Agric. Coll. But none of these species have been reported in the Danish literature.

1. Poria taxicola (Pers.) Bres.

Syn.: *Xylomyzon taxicola* Pers.; *Merulioporia taxicola* (Pers.) Bond. & Sing.; *Polyporus rufus* Schrad. ex Fr.?; *Poria rufa* (Schrad. ex Fr.) Cooke; *Polyporus haematodus* Rostk.; *Poria haematodes* (Rostk.) Egeland.

The fruit body resupinate, membranaceous or fleshy membranaceous, adherent, 5—6×5—6 cm., often confluent, forming rather big crusts; margin normally adpressed, but sometimes free and slightly reflexed, 1—3 mm broad, white, velvety-pubescent. Pore layer flesh colour to reddish-brown, in dried specimens black, less than 1 mm thick, fleshy-waxy. Tubes at first merulioid, then becoming deeper, somewhat irregular, with entire mouths and obtuse, fertile edges, ca. 5 pr. mm.

Context white, up to 1 mm thick, monomitic, formed of hyaline, branched, septate hyphae, 3—7μ broad, walls up to 1μ thick, several hyphae collapsed, H-connections very common, no clamp connections seen in the context or on the hyphae of the hymenium, but occasionally on mycelium (in pure culture) on very wide and thinwalled hyphae. The context continues directly into the pore trama. Hyphae of dissipiments like those of the context, but all thinwalled and with large intercellular globules of purplish-brown pigment. Basidia 15—25× 3—5μ, forming a compact palisade; no cystidia. Spores hyaline, cylindric-allantoid, 4—6.5 × 1.5μ.

Poria taxicola is not a common fungus in Denmark. It is known from all parts of the temperate zone on the northern hemisphere. It grows on coniferous trees and fallen branches and causes a rather intensive yellow rot.

Material studied: Sjælland: Tisvilde Hegn, July 1898, on *Pinus silvestris,* leg. E. Rostrup; Køge Ås, May 23. 1895, on *Picea abies,* leg. E. Rostrup (both labelled as *Merulius serpens,* corrected by Egeland to *Poria haematodes);* Hundested, Dec. 4. 1951, on *Pinus* sp., leg. et det. L. Harmsen; Asserbo, Oct. 26. 1954, on *Picea* sp., leg. et det. L. Harmsen;

Kregme, Jan. 6. 1956, on a pole of *Picea* sp., leg. et det. L. HARMSEN; all collections from the Botanical Museum of the University.

Sjælland: Tisvilde, July 1. 1898, on *Populus canescens,* leg. E. ROSTRUP; Tisvilde, July 1898, on *Pinus silvestris,* leg. E. ROSTRUP; Hornbæk Plantage, Feb. 1935, on *Pinus silvestris,* leg. BOOTS; Søllerød, Sept. 5. 1936, on worked timber of *Pinus,* leg. N. F. BUCHWALD; Dyssekilde, Sept. 1937, on *Pinus silvestris,* leg. R. HESTEHAVE; Kongelunden, April 15. 1950, on *Pinus,* leg. M. P. CHRISTIANSEN; Asserbo Plantage, June 20. 1951, on *Pinus silvestris,* leg. E. JØRGENSEN. — Jylland: Lammehave Skov, Ry, Oct. 14. 1951, on *Quercus,* leg. N. F. BUCHWALD; 3 other finds without detailed records; all collections det. N. F. BUCHWALD, and from the Herbarium of Dept. Plant. Pathol., Royal Vetr. and Agric. Coll.

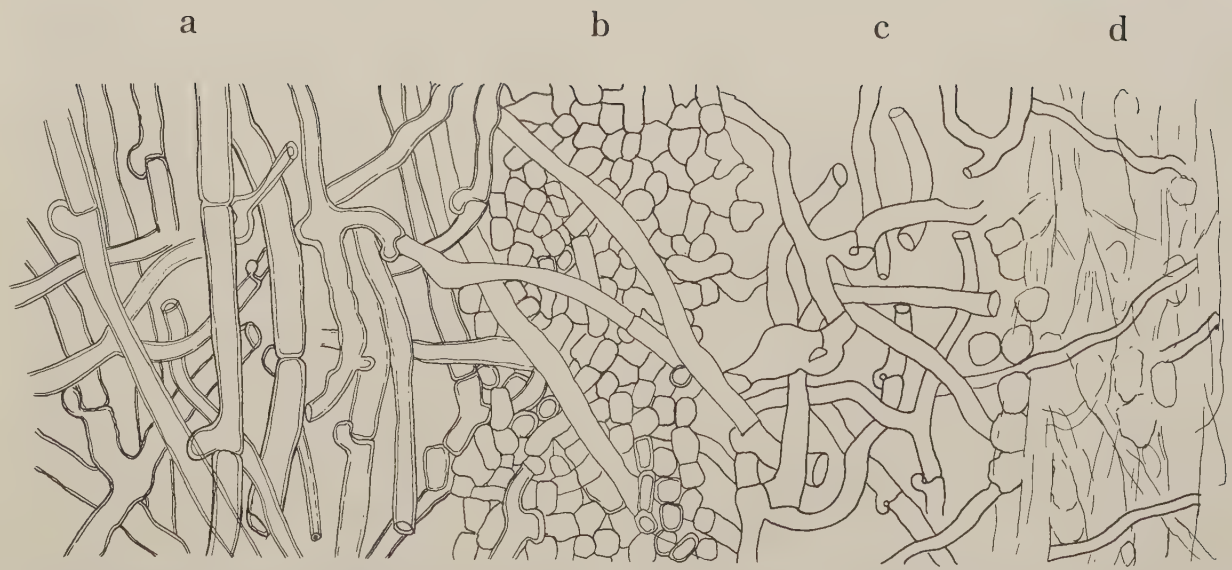
Two collections, from Tisvilde and from Lammehave Skov, grew on deciduous wood; they seem nevertheless to belong here.

2. Polyporus dichrous FR. ex FR.

Syn.: *Leptoporus dichrous* (FR.) QUÉL.; *Bjerkandera dichroa* (FR.) KARST.; *Gloeoporus dichrous* (FR.) BRES.; *Gloeoporus conchoides* MONT.?

The fruit body is sessile, often imbricate, 1.5—3 cm broad, 2—5 mm thick, gelatinous soft when fresh, rigid when dry. Surface of cap white, light grey, isabelline, near basis almost black, tomentose, in concentric zones loosely tufted-hispid. Margin thick, wavy, obtuse, more or less involute as dry, white. Pore layer waxy, in dried specimens horny, reddish purple, on margin more pale, near basis purplish-black to black, easily separable from the context. Pores small, polygonal, regular, with entire mouths, ca. 5 pr. mm, dissipiments thin with obtuse and fertil edges; marginal pores low and indistinct, merulioid.

Context white, 2—4 mm thick, monomitic, composed of hyaline, septate hyphae with slightly thickened walls and numerous clamp connections, either very much branched and leading in all directions, binding the hyphae together, or longitudinal arranged in bunches, sparsely branched with long intervals. Hyphae 2.3—5.1 μ wide, walls up to 1 μ. Context slightly thickened under the tomentose surface cover and forming a distinct pseudoparenchymatic layer over the pore trama, ca. 50 μ thick, penetrated of normal context hyphae. This layer is connected with the pore trama through a ca. 50 μ thick abscission layer, composed of thin-walled, branched, septate, clamped, very loosely woven, 2—5 μ wide hyphae. Hyphae on surface of margin parallel, adpressed, breaking up into tufts as margin developes. Tube trama compact with strongly gelatinized hyphal walls, still penetrated of context hyphae which colour strongly in lactophenol-cottonblue.



Polyporus dichrous. Section through the context and pore trama. a. context; b. pseudoparenchymatic layer; c. abscission layer; d. pore trama. ×1000.

Subhymenium pseudoparenchymatic, not gelatinized. Hymenium forming a very compact palisade of cylindric, 12—15 × 2—4 μ, 4-spored basidia. Numerous large balls of intercellular, purplish-brown pigment present; no cystidia. Spores hyaline, smooth, allantoid, 4—5 × 1—2 μ.

Polyporus dichrous seems to be a rather rare fungus. It grows on fallen branches and trunks of deciduous trees, in Europe esp. on *Betula, Fagus* and *Quercus,* rarely reported on *Conifers.* It is a cosmopolitic species, known from temperate zones of both hemispheres. It is found rather frequently in U. S. A., but is rare in Europe.

Material studied: Sjælland: Horserød Hegn, March 28. 1943, on *Betula,* leg. Ø. WINGE; Helsingør, Dec. 1. 1953, on *Betula,* leg. M. S. KROG; both collections det. N. F. BUCHWALD and from the Herbarium of Dept. Plant. Pathol., Royal Vetr. and Agric. Coll.; Tisvilde, Nov. 13. 1955, on *Betula,* leg. M. LANGE, det. L. HARMSEN; in the Botanical Museum of the University.

It is worth while noting that the two species mentioned above have some taxonomical very important characters in common. The spores are in both species hyaline, cylindric-curved or allantoid, and the colour of the spore layer and the pigment are exactly the same. Besides both of them have as mentioned merulioid pores.

They differ in their anatomy, the one being imbricate, with a distinct stratified context, hyphae with clamp connections, the other resupinate, with homogenous context, hyphae without clamp connections. *Poria taxicola* was carefully examined for stratified context in the reflexed parts of the fruit body, but no such tissue was present. The gelatinous pore trama of *Polyporus dichrous,* which does not exist in *Poria taxicola,* places this species in the genus *Gloeoporus* BRES.

ACKNOWLEDGMENT

The author is indepted to Professor N. F. BUCHWALD, L. HARMSEN, M. Sc., and Dr. MORTEN LANGE, who have supplied me with the material of these two interesting and rare species.

RESUMÉ

En af karaktererne hos slægten *Merulius* — at porerne har fertile rande — træffes også i en lille gruppe af *Poria.* BONDARZEW & SINGER

(1941) har oprettet slægten *Merulioporia* for de følgende tre arter: *Poria taxicola, P. violacea* og *P. purpurea.* Ved en anatomisk undersøgelse af *Polyporus dichrous* har det vist sig, at denne art også har fertile porerande. Det ser således ud til, at den merulioide karakter kan træffes inden for forskellige grupper af poresvampe, der normalt ikke stilles systematisk nær hinanden.

Der er undersøgt 13 danske kollektioner af *Poria taxicola* og 3 kollektioner af *Polyporus dichrous.*

LITERATURE

Bondarzew, A. S., 1953: Polyporaceous fungi of the European part of the U. S. S. R. and the Caucasus.

Bondarzew, A. S. & R. Singer, 1941: Zur Systematik der Polyporaceae. — Ann. Myc. 39: 43—65.

Bourdot, H. & A. Galzin, 1927: Hyménomycètes de France.

Donk, M. A., 1932: Revision der Niederländischen Homobasidiomycetae, Aphyllophoraceae II.

Egeland, J., 1914: Norske resupinate poresopper. — Nyt. Mag. Nat. 52:156.

Overholts, L. O., 1953: Polyporaceae of the United States, Alaska and Canada. — Univ. Mich. Stud. Sci. Ser. Vol. 19.

Pilát, A. 1942: Polyporaceae, I—III, in Kavina, C. & A. Pilát: Atlas des Champignons de l'Europe, Tome 3.

Copenhagen, February 1956.

ON MERULIUS SILVESTER FALCK AND M. HIMANTIOIDES FR.

PRELIMINARY REMARKS

By LOUIS HARMSEN

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Everyone who has to do with investigations on fungi in buildings especially the *Merulius* species, will sooner or later meet the name *Merulius silvester* FALCK in literature and in connection with it, meet different opinions regarding the value of the species.

Many years of investigations on wood destroying fungi have given the author the perception that FALCK in his thorough observations on the *Merulius* species has found characters which have given reason for proposing new species; though it seems that the material used has been heterogene. *Merulius minor* FALCK thus probably has been proposed on specimens partly of *M. pinastri* (FR.) BURT — compare FALCK's remark (1912, p. 400): "Die Art ist wahrscheinlich identisch mit *Merulius umbrinus* FR. und *M. hydnoides* HENNINGS" — partly of *M. tignicola* HARMSEN (HARMSEN 1952).

This matter has presumably contributed to the mycologists' doubt of those of FALCK proposed species, the more so as the species have not been really described.

Cultures of *Merulius silvester* and *M. himantioides*. The publications referring to *M. silvester* also indicate that the species partly include *M. himantioides* FR. (see ULBRICH 1941, p. 23). A photograph published by FALCK (1912, tab. XIV) of a pure culture of *M. silvester* corresponds completely to a culture of *M. himantioides* isolated by the author from a Danish specimen (Fig. 1). The heavy exudation of colourless drops on the mycelium is very characteristic, but it is not seen in an other strain or in cultures neither German nor

Fig. 1: *M. himantioides,* no. 2704 pure culture. ×¼.

Fig. 2: *M. silvester,* no. 3613, pure culture. ×¼.

Danish identified as *M. silvester* (Fig. 2). The present material is too sparse to decide whether this heavy exudation has any diagnostic value. In other ways the cultures of the two species are uniform with white mycelium, in older cultures sometimes with yellow patches, rather loose and with very fine strands radiating from the inoculum; their growth is faster than normal for *M. lacrymans,* which has a similar mycelium in pure culture though usually somewhat more dense. They have both an optimum temperature about 27° C. and maximum temperature a little above 34° C. while *M. lacrymans* has its optimum at 20—22° C. and maximum at 28° C. (table 1). An optimum temperature about 27° C. is found likewise for *M. pinastri* and *M. molluscus* Fr., both occurring as well in the open as in buildings. The temperature relations must be ascribed some significance even if it may be possible to alter them in experiments (Falck, Mez). When

Table 1.

Daily increment in mm (in contemporary experiments)

Culture	Temperature — ° C.				
	15	21	27	31	34
M. silvester, mean of 4 German strains	3.3	5.3	6.5	2.5	0.3
do. 3613	1.6	2.7	3.0	1.8	0.1
M. himantioides, 2704	2.4	4.2	4.8	2.5	0.3
M. lacrymans, 888 (fast growing strain)	3.5	4.6	0.5	0	0
do. German strain	1.5	2.6	0.7	0	0

isolated and kept under uniform conditions the temperature relations of the cultures will be constant.

The fruit bodies of the two species have like *M. lacrymans* the characteristic rugulose-porose surface and yellow to yellow brown spores of the same size and form. On the basis of the present material it seems that *M. silvester* takes a position between *M. lacrymans* and *M. himantioides*. The fruit body is not as thick as normal *M. lacrymans* but thicker than *M. himantioides*. It is easily detached from the substrate and when dry it is tough and leathery like that of *M. lacrymans*. The sterile margin is flat, indefinite and formed of white, dense mycelium. The fruit body of *M. himantioides* is thin, nearly membraneous, attached to the substrate and is loosened only in flakes. When dry it is brittle. The sterile margin is white, membraneous, formed of rather loosely woven hyphae, often arachnoid.

The mycelial strands are well developed in *M. silvester*. They are grey as in *M. lacrymans,* but not noticed equally vigorous; they are more smooth with a barklike outer layer which is rather easily loosened, and mainly consisting of fiber hyphae. The mycelium between the strands is rather sparse. In *M. himantioides* the superficial mycelium is poorly developed, the strands are most often brownish grey or very dark, rather fine, noticed up to 1 mm.

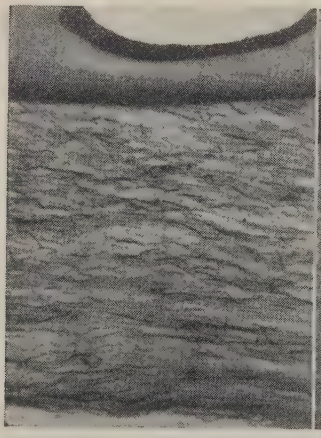


Fig. 3: *M. lacrymans,* section through a thin fruit body; note the thick subhymenial layer; stained with aniline blue in lactic acid. ×30.

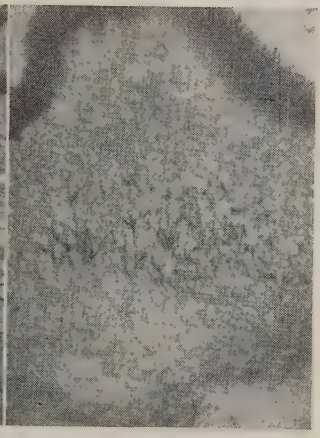


Fig. 4: *M. silvester,* no. 3613, section through fruit body; stained as Fig. 3. ×30.

As will be seen from the present material it might be possible to distinguish the two species frequently, but it is difficult to find exact characters for delimitating them.

The microscopical structure of the fruit bodies (compare table 2) of the two species is distinctly different from *M. lacrymans* which between the hymenium and the context has a layer of densely interwoven hyaline hyphae, more or less gelatinized. Here also the context is rather dense and stratified with numerous brown thick-walled hyphae with septa and clamp connections (Fig. 3). In the other two species the context is loose and spongy, some brown coloured hyphae occur, but they are thin-walled (Fig. 4). A thin layer of hyaline thin-walled hyphae is found in *M. himantioides* between the hymenium and the context (Fig. 5), while no special subhymenial layer in *M. silvester* is seen (Fig. 6).

In the strands the thickness of the fiber hyphae is of special interest. In *M. lacrymans* the mean value is 4 μ (3—5(—5.5 μ)) as given by FALCK (1912) and in *M. silvester* 2.5 μ (2—3(—3.5 μ)). In *M. himantioides* the author has found 1.5—2 μ but fiber hyphae up to 4 μ have been noticed. When stained in Benzo brilliant blue and Benzo brown (STARFINGER 1953) the fiber hyphae in *M. lacrymans* will stain blue, while in *M. silvester* and *M. himantioides* they will stain brown with a slight tinge of blue.

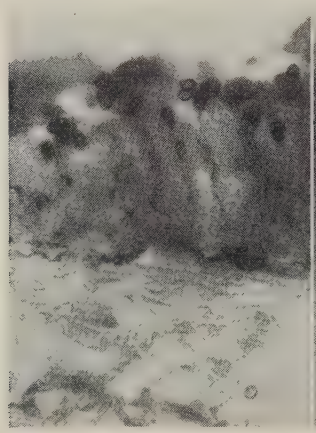


Fig. 5: *M. himantioides,* no. 3885, hymenium and subhymenial layer, stained as Fig. 3. ×330.

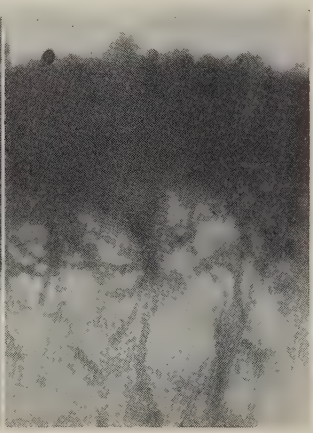


Fig. 6: *M. silvester,* no. 3613, hymenium and part of the context, stained as Fig. 3. ×330.

Table 2.

	M. lacrymans	*M. silvester*	*M. himantioides*
fruit body	thick, fleshy; margin thick, sharp	rather thick; margin flat, indefinite, formed of dense mycelium	thin; margin membraneous of loose woven hyphae, arachnoid
	easily detached from substrate; tough and leathery when dry		attached; brittle when dry
	subhymenial layer of densely interwoven, hyaline hyphae, ± gelatinized	no special subhymenial layer	thin subhymenial layer of thin-walled, hyaline hyphae
	context rather dense, with numerous brown, thick-walled hyphae with septa and clamp connections	context loose, spongy, with some brown but thin-walled hyphae with septa and clamp connections	
superficial mycelium	vigorous, often as greyish, skinlike flakes, also between the strands	rather well developed, sparse between the strands	sparse and passing
	strands vigorous, up to 8 mm, grey, surface uneven, wolly	strands rather vigorous, up to 4—5 mm, grey to brown, smooth with "bark" of fiber hyphae	strands thin, up to 1 mm, grey to brown or dark, wolly
	fiber hyphae about 4 μ (3—5.5 μ), stain blue with B. B.	fiber hyphae about 2.5 μ (1.5—3.5 (—4 μ)) (2—3.5 μ)	(1.5—2.5(—4 μ)), stain brown and partly slight blue with B. B.
temperature relations	optimum 20—22° C; max. about 28° C	optimum 27—28° C; max. about 35° C	
losses in weight of wood blocks (spruce) exposed to attack during 4 months	50—60 %	about 14 % (5—18 %)	about 7 % (4—10 %)

Some experiments have been done in respect of the ability of the fungi to decompose the wood. Pure cultures of *M. lacrymans* may as known cause a loss in dry weight of the wood samples on 50—60 per cent or more in 4 months. In experiments with *M. silvester* the loss in dry weight is found to be approx. 14 per cent and with *M. himantioides* approx. 7 per cent.

Conclusions. As a result of the investigations it must be concluded that *M. silvester* is specifically different from *M. lacrymans* and it seems to be specifically different also from *M. himantioides*. *M. silvester* and *M. himantioides* might as well be regarded as extreme forms of a variable species. The author though has seen no intermediate forms.

Wm. Bridge Cooke mentions in a letter (June 1955) to the author that he considers *M. lacrymans, himantioides* and some American species to be all one species, however, not including *M. silvester*. In the same letter he mentions *M. tignicola* as a synonym of *M. pinastri,* the former as a "domestic" form of the "wild" *pinastri*. The author does, however, not agree to these considerations. The fact of regarding *M. lacrymans* as a "domestic" or "dry rot" form of the "wild" *M. silvester* or *M. tignicola* of *M. pinastri* seems no solution of the species conception, as the "wild" species occur as well in buildings as in the open. Should this point of view be of any reality *M. silvester* might better be regarded as a "domestic" form of *M. himantioides* than *M. lacrymans* of *M. silvester*.

At the same time Cooke unfortunately propose to re-introduce the generic name *Serpula* for the brown-spored species. The author, mainly working with wood destroying fungi, would prefer to conserve the generic name *Merulius* which is well known — and feared — as everybody who has to do with timber knows. This because that group of fungi is of very great importance in world economy, and it is therefore a matter of interest, not only for the mycological nomenclature and taxonomy.

Material used. *M. silvester*. Herbarium material: 4 collections from Germany (2 with fruit bodies), 1 Danish with fruit bodies (3613, Asserbo 26/10 1954) and 1 sterile (3827, from cooling waggon, D.S.B. 6/10 1955). Pure cultures: 4 German and 2 Danish cultures.

M. himantioides: 2 collections from Denmark (2704, Gribskov 25/11 1950 and 3885, Kregme 6/1 1956) and 2 Danish cultures.

M. lacrymans: Several Danish collections; 1 Danish and 1 German culture.

SUMMARY

The author has taken up an investigation of *M. silvester* FALCK as compared with *M. himantioides* FR. Differences are seen in the anatomy of the fruit body (compare table 2). On basis of the rather sparse material at hand, it is difficult to decide if they are specifically different; they might be forms of a variable species, though no intermediate forms are seen. *M. silvester* is considered to be specifically different from *M. lacrymans*. It is suggested to conserve the generic name *Merulius* for the brown-spored species of this group of fungi.

LITERATURE

Buchwald, N. F.: De danske Arter af Slægten Merulius (Hall.) Fr. med en særlig Omtale af Gruppen Coniophori Fr. — Dansk Bot. Arkiv 5, Nr. 21. 1928.

Falck, R.: Die Merulius-Fäule des Bauholzes (in Möller: Hausschwammforschungen VI). 1912.

Harmsen, L.: Merulius tignicola sp. nov. og dens Forekomst i Danmark. — Friesia 4. 1953. (Fortryk 1952).

— De danske Merulius-Arter. — Bot. Tidsskr. 50. 1954.

Mez, C.: Der Hausschvamm. — Dresden 1908.

Starfinger, Käthe: Färben der Stränge von Bauholzpilzen zur mikroskopischen Artbestimmung. — Holz-Centralbl. nr. 137. 1953.

Theden, Gerda: Holzzerstörende Pilze in Berliner Gebäuden nach dem Krieg. — Fortschritte und Forsch. im Bauwesen. Reihe D. Hf. 11. 1953.

Ulbrich, E.: Hausschwamm, Nassfäulen (Trockenfäulen) und andere Zerstörer unserer Häuser und Bauten. — 1941.

Copenhagen, February 1956.

DIE IN FINNLAND BISHER GEFUNDENEN WASSERPILZE

Von ERNST HÄYRÉN

Die Wasserpilze sind in Finnland bisher nur mehr oder weniger zufällig untersucht worden. Nachstehend folgt ein Verzeichnis der beobachteten Arten. Durch künftige Untersuchungen wird die Anzahl der Arten in dem an verschiedenartigen Gewässern sehr reichen Lande sicher erheblich steigen. Wenn im Folgenden nicht anders erwähnt wird, ist die Art in der Gegend von Helsingfors gefunden.

Olpidiaceae

Plasmophagus oedogoniorum DE WILD. var. *ulothricis* WILLE. Im Frühjahr in *Hormidium flaccidum* in den Schmelzlöchern im Eise. — Mem. 5, S. 137. 1929.

Rhizidiaceae

Phlyctidium laterale A. BRAUN var. *minus* HÄYR. Im Flusse bei der Stadt Borgå in Südfinnland. Auf *Ophiocytium parvulum*. — Bidrag 88, No 5, S. 106. 1944.

Rhizophidium sphaerocarpum (ZOPF) FISCHER. Sockenbacka in der Nähe von Helsingfors. Auf *Tribonema viride*. — Mem. 20, S. 6. 1945.

Phlyctochytrium vernale (ZOPF) SCHRÖTER. In *Chlamydomonas*. — Mem. 5, S. 138. 1929.

Ancylistaceae

Lagenidium Rabenhorstii ZOPF. In steriler umhertreibender *Spirogyra*. — Bidrag 80, No 3, S. 110. 1921.

Ancylistes Closterii PFITZER. In einem Schärentümpel im Kirchspiel Korpo, Regio aboënsis. — Mem. 30, S. 18. 1955.

Monoblepharidaceae

Monoblepharis sphaerica CORNU. Nykyrka auf dem Isthmus karelicus (ausserhalb der politischen Grenze Finnlands). — Medd. 29, S. 166. 1904.

Saprolegniaceae

Saprolegnia dioica DE BARY. — Medd. 29, S. 165. 1904. — Mem. 18, S. 89—93. 1943. — Comm. Biol. 15, No 3, S. 1—45. 1954.

S. monoica (PRINGSH.) DE BARY. — Medd. 29, S. 165. 1904. — Mem. 20, S. 149. 1945.

S. Thuretii DE BARY. — Medd. 29, S. 165. 1904.

S. torulosa DE BARY. — Medd. 29, S. 165. 1904.

S. asterophora DE BARY. Isthmus karelicus (ausserhalb der politischen Grenze Finnlands). Auf einem Brachsen. — Mem. 4, S. 50. 1928.

Leptolegnia caudata DE BARY. Auf toten Chironomidenlarven. — Mem. 31. 1956.

Achlya prolifera (NEES) DE BARY. — Medd. 29, S. 166. 1904.

A. polyandra (HILDEBRAND) DE BARY. — Medd. 29, S. 166. 1904. — Mem. 20, S. 149. 1945.

A. racemosa (HILDEBR.) PRINGSH. — Medd. 29, S. 166. 1904.

A. spinosa DE BARY. — Mem. 20, S. 149. 1945.

Leptomitaceae

Gonapodya polymorpha THAXTER. Im Kirchspiel Ilomantsi, Karelia borealis. — Mem. 5, S. 97. 1929.

Leptomitus lacteus (ROTH) AGARDH. In verschmutzem Süsswasser und auf einem toten Stichling. — Medd. 29, S. 166. 1904. — Mem. 6, S. 121. 1929—1931. — Mem. 20, S. 7. 1945.

VERKÜRZUNGEN

Bidrag = Bidrag till kännedom af Finlands natur och folk, utgifna af Finska Vetenskaps-Societeten.
Comm. Biol. = Commentationes Biologicae, Societas Scientiarum Fennica.
Medd. = Meddelanden av Societas pro Fauna et Flora Fennica.
Mem. = Memoranda Societatis pro Fauna et Flora Fennica.

Helsingfors, Januar 1956.

OM FUND AF JUDASØRE (HIRNEOLA AURICULA JUDAE (L.) Berk.) I KORSØR OG NÆRMESTE OMEGN

Af K. HAUERSLEV

Siden den 27. September 1953, da jeg første Gang fandt et lille Eksemplar af Judasøre *(Hirneola auricula Judae)* i Korsør Skov (Lokalitet Nr. 1, se Kortet), har jeg holdt en Del Hyldetræer *(Sambucus nigra)* under Observation for eventuelt at finde flere Eksemplarer. Tidligt paa Aaret 1954 fandtes derefter et enkelt Individ, ogsaa i Korsør Skov (Lokalitet Nr. 3). I Sommeren 1954 iagttoges yderligere flere Frugtlegemer paa Lokaliteterne Nr. 3 og 5. I Vinteren 1954 blev Antallet af Findesteder forøget med Lokaliteterne Nr. 4, 6, 43 og 45, og en ret stor Posefuld indsamledes. Den varme og tørre Sommer 1955 frembragte ingen Eksemplarer af Judasøre, men sent paa Aaret begyndte Svampen atter at bryde frem, og i December fandtes den i Overflod mange Steder. I Juledagene 1955 noteredes den saaledes paa ca. 50 Lokaliteter, og der indsamledes ca. 400 Gram Svampe (tørret Vægt). Alle Fund var hidtil blevet gjort paa Hyld *(Sambucus nigra)*, Artens almindelige Værtplante, men iblandt de sidste Fund fra Juledagene stammede et Par fra Poppel *(Populus* sp.) og Kirsebær *(Cerasus vulgaris)*, der begge er nye Værter for Svampen i Danmark. En Hyldegren i ca. 2 m's Højde (Lokalitet Nr. 20) var besat med et Dusin grumset-mælkehvide Frugtlegemer. De største og de fleste Eksemplarer fandtes paa Grene og Stammer af Hyld, der laa paa Jorden. Ingen Eksemplarer er set i over ca. 2½ m's Højde.

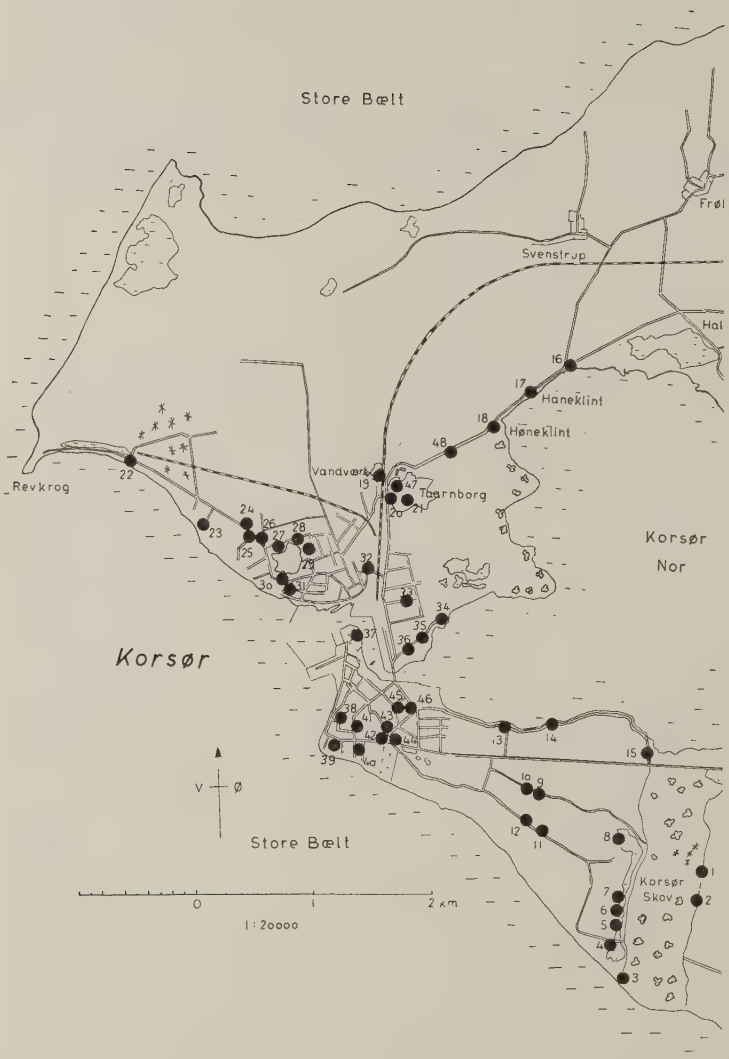
I Betragtning af, at Judasøre i Almindelighed anses for en her i Landet sjælden Svampeart, skal der nedenfor gives en samlet Fortegnelse over de ialt 48 Lokaliteter i Korsør og nærmeste Omegn, hvor jeg i de sidste Par Aar har samlet den. Tallene i Fortegnelsen henviser til Findestedernes Nummer paa det vedføjede Kort (S. 269).

Buchwald (1928) har tidligere henledt Opmærksomheden paa den ejendommelige geografiske Udbredelse af Judasøre her i Landet. Den synes nemlig at være en udpræget „oceanisk" Art, der kun kan vokse nær Kysterne af de større Landsdele eller paa Smaaøer, og kan paa saadanne Steder undertiden endog optræde i meget stor Mængde, f. Eks. paa Hesselø og langs Kysterne af Bornholm. Min Paavisning af Svampens hyppige Forekomst i Korsør og Omegn, altsaa langs Kysten af Store Bælt, stemmer saaledes ganske overens med tidligere Iagttagelser over dens Udbredelse.

FORTEGNELSE OVER LOKALITETER

Hyld *(Sambucus nigra).*

1. Korsør Skov, Østrand: Gruppe paa et Dusin Træer; her er næsten altid Svampe, især paa en væltet Stamme.
2. Korsør Skov, Østrand: Gruppe paa en Snes Træer; kun faa Eksemplarer.
3. Korsør Skov, Vestrand nær Havet: Et enkelt Træ med mange Individer.
4. Søskær Mose: Et Træ paa Roden med faa Eksemplarer og nogle fældede Træer med mange og store Frugtlegemer.
5. Søskær Mose: ½ Dusin Træer, hvor der næsten til Stadighed har været nogle faa Individer.
6. Søskær Mose: ½ Dusin Træer med kun faa og smaa Eksemplarer.
7. Søskær Mose: Et enkelt mindre Træ med et Par Individer.
8. Søskær Mose: Et enkelt stort Træ med et Par Svampe.
9. Forreste Markvej: Hegn af høje, klippede Træer med mange Frugtlegemer.
10. Forreste Markvej: Ligeledes.
11. Bageste Markvej: Lavt klippet Hyldehegn med et Par Haandfulde Eksemplarer.
12. Bageste Markvej: Enkelte Træer i et klippet Hegn med faa Frugtlegemer.
13. Fjordstien ved Grusgraven: Et Par Træer med faa Frugtlegemer.
14. Fjordstien ved Kolonihaverne: Hegn paa Skrænten med faa Eksemplarer.
15. Fjordstien ved Opgangen til Skoven: Et Par Hyldetræer i et Slaaenhegn med faa Individer.



Kort over Korsør og nærmeste Omegn med Findesteder for Judasøre *(Hirneola auricula Judae* (L.) BERK.).

16. Landevejen til Halseby, hvor der drejes af til Svenstrup: Et Hegn ved en Have med faa Frugtlegemer.
17. Landevejen, Haneklint ind mod Vejen: En halv Snes Træer med tykke Stammer; her samledes en lille Kurvfuld Svampe.
18. Landevejen, Høneklint ind mod Vejen: En halv Snes Træer og væltede Stammer; her samledes flere Haandfulde Frugtlegemer.
19. Lunden ved Vandværket: Et fældet Træ med en Haandfuld store Svampe.
20. Taarnborg Park: Et Par Træer ud mod Vejen med et Par Haandfulde Eksemplarer.
21. Taarnborg Park: En gruppe paa et Dusin Træer med faa Individer.
22. Revvej, vest for den nye Havn: Lavt Hegn og Buske i Grøften: Judasøre voksede mest paa Grene tæt ved Jorden; der indsamledes en lille Kurvfuld til Dels store Eksemplarer.
23. Revvej, Pilevænget: En enkelt Svamp paa en nedfalden Gren i Krattet.
24. Revvej, Grosserer Næsteds Have: Faa Eksemplarer paa en Række nedskaarne Træer i et Hegn.
25. Revvej, ved Privatvejen til Frugtplantagen: Paa Stammen af et stort Træ en Haandfuld Frugtlegemer.
26. Revvej: Hegn ved Kolonihaverne med faa Svampe.
27. Birkemosevej: Højt Hegn ved en Have med faa Individer.
28. Birkemosevej: Mindre, fritstaaende Busk med faa Svampe.
29. Slotsvej: Hegn ved en Have med faa Eksemplarer.
30. Revvej Nr. 78: Et Træ i en Forhave med faa Eksemplarer.
31. Hejsesvej, „Kærlighedsstien“: Hegn ved en Have med faa Frugtlegemer.
32. Ved Viadukten: En nedskaaret Busk med en Haandfuld Individer.
33. Magleøgade Nr. 22: Et Træ i Forhaven med faa Eksemplarer.
34. Lilleøvej: Større Træ ved en Fiskerhytte med en Haandfuld Frugtlegemer.
35. Lilleøvej: En Busk med faa Frugtlegemer.
36. Lilleøvej: En Busk med faa Frugtlegemer.
37. Fæstningsterrænet: Et Træstød samt flere spredte Træer eller Trægrupper; her samledes flere Haandfulde Frugtlegemer.
38. Flasken Nr. 3: Træ i en Have med faa Eksemplarer.
39. Badstuevej Nr. 16: Et Træ i en Have med faa Eksemplarer.
40. Lützensvej: Et Træ ved „De Gamles Hjem“ med faa Individer.
41. Nygade Nr. 25: En Busk med faa Svampe.

42. Møllebjergvej, ved Mathiesens Have: Et Hegn med faa Frugtlegemer.
43. Sandvejsbanken, Fischers Have: Faldefærdig Stamme med faa Eksemplarer.
44. Kjærsvej i Quistgaards Have: Et Træ med en Haandfuld Eksemplarer.
45. Jens Baggesensgade i Ejlerts Have: Et Træ med en Haandfuld Frugtlegemer.
46. Tejlmanns Alle, ved Gasværket: Flere Træer, men kun eet Frugtlegeme.

Kirsebær *(Cerasus vulgaris)*.

47. Taarnborg Park: Ca. 7 cm. tyk Gren paa Jorden med nogle mindre Eksemplarer.

Poppel *(Populus* sp.)

48. Landevejen til Halseby: En Stribe af Frugtlegemer op ad den afbarkede Del af Stammen af et Vejtræ.

SUMMARY

A mass occurrence of Hirneola auricula Judae (L.) Berk. in Korsør, Sealand, in Denmark.

After a single specimen of *Hirneola auricula Judae* (L.) BERK. found in 1953 near the town Korsør (Sealand, Denmark) an increasing number of finding-places has been discovered here. In the Christmas holidays ca. 400 gr. of the mushrooms (dried) was collected from ca. 50 localities.

LITTERATUR

Buchwald, N. Fabritius: Om en Masseforekomst af Judasøre (Hirneola auricula Judae (L.) Berk.) paa Hesselø. — Meddelelser Foren. t. Svampekundsk.'s Fremme 4: 21—24. 1928.

Copenhagen, February 1956.

RECHERCHES SUR LE CYCLE DE COPRINUS DISSEMINATUS (Pers. ex Fr.) S. F. Gray

Par J. P. JENSEN

Les recherches sur le *Coprinus disseminatus* traitées ici ont eu lieu au parc „Jægersborg Dyrehave" à Klampenborg près de Copenhague. Elles comprennent la période allant du commencement de mai jusqu'à la fin de septembre 1948.

Plusieurs localités ont été étudiées, dont les trois indiquées sur le tableau, à savoir:

A. Souche très pourrie de *Ulmus*
B. Souche assez fraîche de *Acer campestre*
C. Base du tronc de *Fraxinus* sur l'écorce. Arbre sur pied.

Pendant la plus grande partie de la saison indiquée, la pluie est tombée avec des intervalles de sécheresse de sorte qu'il paraît possible d'établir un lien entre certaines tombées de pluie et l'apparition du champignon et de constater que la croissance commence 4—5—6 jours après une tombée de pluie suffisante.

Elle a — d'une manière constante — duré 5 jours, c. à. d. au quatrième jour après leur apparition les champignons s'affaissent en état noirci.

La petit Coprin a fleuri 7 fois au cours de la saison en question, revenant en même temps dans les différentes localités, le plus vite sur la souche pourrie, un jour ou deux plus tard sur les autres hôtes, mais toujours de telle sorte que les mêmes endroits sont tout à fait envahis par les corpuscules.

1re floraison: (date de l'apparition) le 4 juin, causée semble-t-il par les pluies 28/5 6 mm, 29/5 25 mm et 30/5 6 mm après trois semaines assez sèches.

Tableau des quatre dernières floraisons de *Coprinus disseminatus*.

1948 Août	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Pluies mm							7	18	9	1	1							12	3		1	8	8	3		14		1		2	
A											+	+	+	+	+									+	+	+	+	+			
B												+	+	+	+	+									+	+	+	+	+		
C													+	+	+	+	+									+	+	+	+	+	

1948 Septembre	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Pluies mm	1			1		1						3		1	2		2		5	9		7		3	6	1		4		1
A				+	+	+	+	+												+	+	+	+	+						
B					+	+	+	+	+												+	+	+	+	+					
C						+	+	+	+	+												+	+	+	+	+				

2me floraison: le 4 juillet. Pluies: 29/6 9 mm, 30/6 7mm et 1/7 3 mm. Dans l'intervalle 4—28 juin l'humidité ne mesurait que 10 mm en tout.

3me floraison: le 24 juillet. L'humidité tombée le 12—17/7 était due à des averses d'orage fort limitées. Impossible d'établir ici la relation faute de connaissance exacte.

4me floraison: le 11 août. Pluies: 7/8 7 mm, 8/8 18 mm et 9/8 9 mm. La période précédente 18/7—6/8 donnait seulement 2 mm.

5me floraison: le 24 août. Pluies: 18/8 12 mm et 19/8 3 mm. Retardée ou non par la floraison précédente.

6me floraison: le 4 septembre. Pluies: 22—26/8 environ 30 mm. L'apparition paraît ici retardée par la floraison précédente.

7me floraison: le 20 septembre. Pluies: 12—17/9 7 mm (?). Sans relation marquante.

Les quatre dernières floraisons sont indiquées en détail sur le tableau qui montre qu'une régénération a eu lieu au bout de 11 à 13 jours.

Quant à la température, elle a oscillé d'une manière stable entre 15^0 et 30^0 le jour et 10^0—20^0 la nuit.

Copenhague, février 1956.

MONASCUS RUBER van Tiegh. DEMONSTRATED IN DENMARK

By HENRIK ALB. JÖRGENSEN

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In September 1949 the Department of Plant Pathology of the Royal Veterinary and Agricultural College received from Mr. Albert Hansen, Director of Alfred Jörgensen's Zymological Laboratory, Copenhagen, for determination a culture of a fungus which had been isolated from the faeces of a child. It was stated that the mycelium assumed an intense red colour when cultivated on an acid nutrient medium.

The fungus was transferred to the four following media: 2% potato-dextrose-agar; 2% potato-dextrose-agar with an addition of 0.1% malic acid, sterilized in a current of water vapour (pH 4.2); autoclaved whole milk (pH 7.2); and autoclaved curdled milk (pH 4.5). The cultures were allowed to stand at ordinary room temperature.

In a few days, growth was ascertained on all media, and after ten days in both of the agar cultures a red mycelium had developed, which was proved by microscopy to contain perithecia as well as conidia.

The perithecia, which were suggestive of *Papulaspora*-bulbils, were brownish red, roundish, had a mycelium appendage, and measured 35—40 μ in diameter. The hyaline, ellipsoid ascospores measured 4.5—6 × 3—4.5 μ, on an average 5.25 × 3.75 μ (10 spores were measured).

The conidia, which were present in large numbers, were brownish, pearshaped, and measured 10—13 × 8—11 μ, on an average 11.75 ×

9.25 μ (10 conidia were measured); they were constricted off terminally from short hyphae, often 2 or 3 in a row, and may be designated as aleuriospores (VUILLEMIN 1910, 1931).

Hence, there could be no doubt that the species of fungus concerned might be grouped under the genus *Monascus* VAN TIEGH., within the order *Eurotiales (Plectascales)*. Fungi of this order form fruit bodies surrounded by a pseudoparenchymatous peridium within which asci are formed irregularly in the loose parenchyma; on their maturity the ascospores are released passively by the decay of the asci.

Judging from the literature available on the subject (LIND 1913, O. ROSTRUP 1916 and 1935, KLÖCKER 1924, and ALFR. JÖRGENSEN 1940), none of the species of *Monascus* have ever been observed in Denmark before.

According to YOUNG (1930), five well-defined species of *Monascus* have been described, viz. *Monascus ruber* VAN TIEGHEM (1884), the type species; *M. mucoroides* v. TIEGH (1884); *M. purpureus* WENT (1895); *M. Barkeri* DANGEARD (1907); and *M. olei* PIEDALLU (1910).

It does not appear, either from PETRAK's Verzeichnis (1938—39, 1944) or the „Index of Fungi" (1940—55), that new species of this genus have been described later.

In the determination of the fungus sent in, *Monascus mucoroides* could be left out of consideration directly because — unlike the present one — it will not form a red pigment in culture.

All the four other species form a more or less intense red pigment and differ only by minor characters.

Monascus olei is most easily distinguishable from the other three species by biological characters; for one thing, it is more thermophilic, it can grow at temperatures right up to 46° C; and for this reason it could be ruled out.

The last three species: *Monascus ruber, M. purpureus* and *M. Barkeri,* can be distinguished from each other by certain minute dissimilarities in shape and size of the perithecia, and, besides, there is a difference in the colour of the ascospores, both *M. purpureus* and *M. Barkeri* having reddish ascospores — purple and brownish red, respectively — while the ascospores of *M. ruber* are hyaline. As the isolate received had hyaline ascospores, the species should thereby be determined as *Monascus ruber.*

To support the determination, pure cultures of *Monascus ruber* and *M. purpureus* were imported from "Centraalbureau voor Schimmelcultures" at Baarn, in Holland, and for comparison these were

cultivated co-ordinately with the culture which was sent in from ALFRED JÖRGENSEN'S Zymological Laboratory and which in the following is just termed "the Danish isolate".

Thereby it was established that the Danish isolate was in agreement with the Dutch pure culture of *Monascus ruber,* forming ellipsoid, hyaline ascospores and developing numerous conidia on potato-dextrose-agar; moreover, the mycelium remained red on an acid medium, in contrast to the Dutch pure culture of *Monascus purpureus,* which formed spherical — sometimes slightly ellipsoid — reddish ascospores, developed but few conidia on potato-dextrose-agar, and whose mycelium assumed a yellowish colour on an acid medium.

On the basis of the abovenamed characters it may be considered certain that the Danish isolate belongs to the species *Monascus ruber* VAN TIEGHEM, a species which was described in France in 1884 after having been found on boiled potatoes as a pollution of another fungus culture.

The genus *Monascus* is represented in all parts of the world and occurs particularly on amyliferous substrates at comparatively high temperatures. In East Asia a couple of the species are cultivated extensively on rice, which, after the fungus has grown through it, is dried and ground, to be used afterwards as an ingredient in the preparation of various foods and alcoholic liquors.

ACKNOWLEDGMENT

Acknowledgment is due to Professor N. FABRITIUS BUCHWALD for valuable advice and criticism during the preparation of this paper.

BIBLIOGRAPHY

Barker, B. T. P.: Morphology and Development of the Ascocarp in Monascus. — Ann. Bot. 17: 167—236. 1903.

Dangeard, P. A.: Le développement du périthèce. — Le Botaniste, Sér. 10: 1—385. 1907.

Jörgensen, Alfred: Die Mikroorganismen der Gärungsindustrie 6. Aufl. Neubearbeitet von Albert Hansen & Aage Lund, Jena 1940.

Klöcker, Alb.: Die Gärungsorganismen in der Theorie und Praxis der Alkoholgärungsgewerbe. 3. Aufl. Berlin 1924.

Kuyper, H. P.: Die Perithecien-Entwicklung von Monascus purpureus Went und Monascus Barkeri Dangeard, sowie die systematische Stellung dieser Pilze. — Ann. Myc. 3: 32—81. 1905.

Petrak, F.: Verzeichnis der neuen Arten, Varietäten, Formen und wichtigsten Synonyme der Pilze. 1930, 1931, 1932—35. — Just's Botan.

Jahresbericht 58 (1930), Abt. 1: 447—570, 1938; 60 (1931), Abt. 1: 449—514, 1939; 63 (1935), 2. Abt.: 805—1056, 1944.

Petrak, F.: Index of Fungi 1936—1939. — Published by Commonwealth Mycological Institute, Kew. 116 pp., 1950.

Piedallu, A.: Sur une nouvelle moisissure du tannage à l'huile. Monascus olei. — Compt. Rend. Acad. Sci. Paris. 151: 397—399. 1910.

Rostrup, O.: Bidrag til Danmarks Svampeflora. I. (Contributions to the fungus-flora of Denmark. I.). — Dansk Bot. Arkiv 2, Nr. 5: 1—56. 1916.

— : Bidrag til Danmarks Svampeflora. II. (Contributions to the fungus-flora of Denmark. II.). — Dansk Bot. Arkiv 8, Nr. 8: 1—74. 1935.

van Tieghem, M.: Monascus, genre nouveau de l'ordre des Ascomycètes. Bull. Soc. Bot. France. 31: 226—230. 1884.

Went, F. A. F. C.: Monascus purpureus, le champignon de l'Ang-Quac, une nouvelle Thélébolée. — Ann. Sci. Nat. Bot., Sér. 8: 1—18. 1895.

Young, E. M.: Physiological Studies in Relation to the Taxonomy of Monascus spp. — Trans. Wisc. Acad. Sci., Arts Lett. 25: 227—244. 1930.

Index of Fungi. 1940—1954. — Publish. by Commonwealth Mycological Institute, Kew, 1940—1955.

Lyngby, January 1956.

ON THE SONCHUS RUST PERISTEMMA PSEUDOSPHAERIA (MONT.) N. COMB. (SYN. PUCCINIA SONCHI ROB.)

By IVAR JØRSTAD

The *Sonchus* rust that in more than a hundred years has passed under the name of *Puccinia sonchi,* is certainly no true *Puccinia,* owing to the uredospores being produced in a peridium; nor is the specific epithet "sonchi" tenable, as the oldest valid name of the rust is *Puccinia pseudosphaeria* Mont.

It seems that GROVE (1913, p. 156) was the first one to discover the peridial condition of the uredosori, stating that the "so-called paraphyses are really the upper part of a delicate, imperfect peridium, composed of hyaline pseudo-parenchyma (cells 5—10 μ diam.); at the top these cells become elongated, linear parallel, at first colourless, then brownish and more or less clavate, and finally very dark brown, subopaque and irregular". GROVE also expressed the opinion that "the species is widely different from a typical *Puccinia*". LAMB (1934, p. 185) agrees with GROVE, stating that "die Paraphysen seien in Wirklichkeit der obere Teil eines zarten Pseudoperidiums".

H. SYDOW (1921, p. 174) places the rust near *Miyagia,* which like the *Sonchus* rust possesses *Puccinia*-like teleutospores, and in which the uredospores, and subsequently the teleutospores, develop in a funnel-shaped peridium consisting of elongated, paraphyse-like cells. But as the sole member of *Miyagia* then known, viz. *M. anaphalidis* Miyabe, is an aut-euform possessing also aecidia, H. SYDOW erected the new genus *Peristemma* for the brachyform *Puccinia sonchi;* apparently he would otherwise have placed it in *Miyagia.* However, such difference is not considered to be of generic importance any more, and the genus *Peristemma* has, in fact, never been recognized; it has generally been looked upon as synonymous with *Puccinia,* what is rather surprising, considering that H. SYDOW placed it in the vicinity of *Miyagia,* which

is recognized as a valid genus by most authors; this is also in accordance with the view of the present author.*)

The question now is, ought *P. sonchi* to be incorporated in *Miyagia,* or should it be placed in a separate genus, which then must carry the name of *Peristemma*? I am in support of the latter view, as in the long peridia of *Miyagia,* in which the spores are found at the bottom, the peridial cells form a compact stockade, while in *P. sonchi* the peridia are short and in their upper part consisting of more or less free paraphyses with swollen tips. In H. SYDOW'S description of the genus *Peristemma* the following passage "Uredolager .... von einem Kranz lang zylindrischer oben tiefbrauner Paraphysen umgeben" may be accepted as expressing the main distinction from *Miyagia.*

Anyway, I think the *Sonchus* rust must be considered rather closely allied to *Miyagia* and *Corbulopsora;* the latter genus only differs in possessing 1-celled teleutospores and possibly ought to be incorporated in *Miyagia.* For *Miyagia* are known two species and for *Corbulopsora* three; all occur on compositous hosts, viz. *Miyagia* on *Anaphalis* and *Gnaphalium* in the East Asiatic islands from Saghalien to Formosa (dubious reports from China and Ceylon), and *Corbulopsora* on *Olearia* in New Guinea and on *Lactuca* in South India. It is rather suggestive, that in *Corbulopsora cumminsii* Thirum., on *Lactuca runcinata* DC. in Bangalore, South India, a host closely related to *Sonchus,* the palisade cells of the peridia possess free and swollen tips, as in the *Sonchus* rust (cp. THIRUMALACHAR 1947, pp. 235—236). In this connection may be mentioned, that the *Sonchus* rust is extremely variable with respect to the presence of 2- and 1-celled teleutospores; often solely 1-celled spores are found, in other instances solely 2-celled ones or both kinds may occur in the same sori. Owing to the rust sometimes having 1-celled teleutospores only, it has twice been described as belonging to *Uromyces.*

The uredosori are surrounded by vertical, hyaline hyphae forming a kind of stroma. The teleutospores may develop within emptied uredosori or in separate teleutosori; the latter are, contrary to the uredosori, long covered by the epidermis and mostly with loculi, like many species of *Puccinia* and *Uromyces* ("téliosores corbiculés", acc. to KUHNHOLZ-LORDAT (1941)). There are, however, no principal differences between the stromatic structure of the uredosori and the teleuto-

*) However, neither TROTTER (1925, p. 673) nor TRANZSCHEL (1939, p. 392) did accept *Miyagia* as a valid genus and they changed the name of the type species to *Puccinia anaphalidis* (MIYABE) SACC. & TROTT. and *P. anaphalidis* (MIYABE) TRANZ., respectively.

sori; they are essentially of similar type, but in the long-covered teleutosori free paraphyse tips are less or not at all apparent. Instructive drawings of uredosori of the *Sonchus* rust are published by MAGNUS (1901, plate XIV, fig. 3) and LAMB (1934, p. 184, fig. 1), by the latter author also of teleutosori (with 1-celled teleutospores).

Regarding the specific name of the *Sonchus* rust C. MONTAGNE described the species in 1840 under the name of *Puccinia pseudosphaeria,* while the name *P. sonchi* ROB. dates from 1849. However, in 1856 MONTAGNE republished without alterations his diagnosis of *P. pseudosphaeria,* terming it a new species and without referring to his earlier description; as the latter was published in a work not well known by mycologists, it was generally overlooked. However, the oldest name, viz. from 1831, is *Aecidium sonchi* JOHNST., but as referring to the uredo-stage it is not valid; owing to the peridial paraphyses the uredosori have some faint resemblance to aecidia. — A full synonym list follows:

Peristemma pseudosphaeria (MONT.) JØRST. n. comb.

[Aecidium sonchi JOHNST., Flora of Berwick, 2, p. 205, 1831.]
Puccinia pseudosphaeria MONT. apud BARKER-WEBB & BERTHELOT, Hist. Nat. Iles Canar., III, 2, p. 89, 1840.
P. sonchi ROB. ex DESM., Ann. Sci. Nat., Bot., III, 11, p. 274, 1849.
P. pseudo-sphaeria MONT., Syll. Pl. Crypt., p. 313, 1856.
[Aecidium sonchi WEST., Bull. Acad. R. Sci. Belg., 2. Sér., 11, p. 649, 1861.]
Uromyces sonchi OUDS., Rabh., Fungi Eur., No. 1952, 1872.
U. puccinioides FAUTR. & ROLL. apud Roumeg., Rev. Mycol. 15, p. 15, 1893.
Puccinia tagananensis P. MAGN., Ber. D. Bot. Gesellsch. 19, p. 297,1901.
Peristemma sonchi H. SYD., Annal. Mycol. 19, p. 175, 1921.

Peristemma pseudosphaeria lives in the Eastern Hemisphere on many species of *Sonchus,* but is also reported (cp. H. & P. SYDOW & BUTLER 1907, p. 494, and BUTLER & BISBY 1931, p. 74) from the Himalayas and from Mysore in South India on *Launaea nudicaulis* (L.) HOOK (syn. *Zollikoferia nudicaulis* BOISS.), which is allied to *Sonchus.*

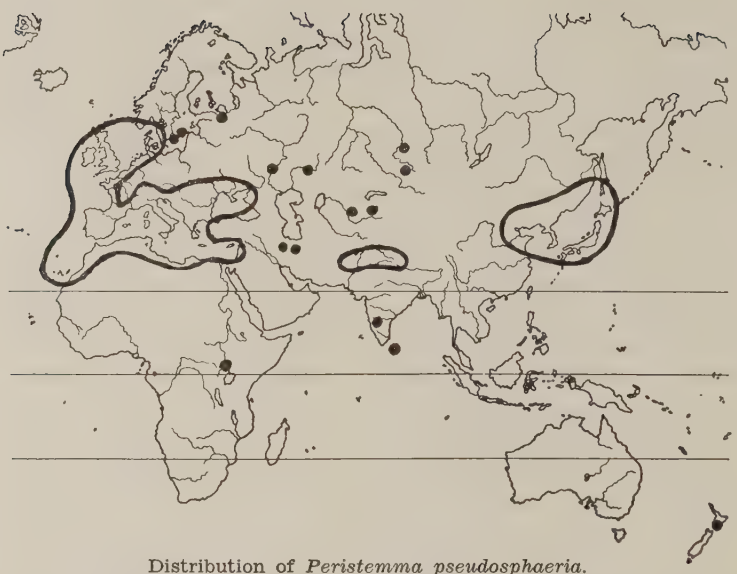
Main hosts of the rust are in Europe the common weeds *Sonchus arvensis* L. s. l.*), *asper* (L.) HILL, and *oleraceus* L. On these 3 hosts it has been found also in North Africa. On *S. arvensis* it has, further,

*) Incl. *Sonchus brachyotus* DC., *decorus* CAST., *mauritanicus* BOISS & REUT., and *uliginosus* M. B.

a wide distribution in Asia (in the East particularly on the var. *laevipes* KOCH (syn. var. *uliginosus* Trautv. = *S. uliginosus* M. B.), while the known Asiatic distribution on *S. oleraceus* appears to be restricted to Cyprus and Palestina, but on this host it has also been reported from New Zealand (it seems that the rust has not been reported on *S. asper* from Asia). On *S. palustris* L. the rust has been found along the North Sea and in Southeast Europe, on *S. maritimus* L. in the European Mediterraneans from Portugal to Sicily, but is also reported from Tunis, Tripolis and Persia, on *S. tenerrimus* L. in the European and African western Mediterraneans and in Palestina, on *S. glaucescens* JORD. (= *S. asper* ssp. *glaucescens* MAIRE) in Morocco and Algeria, further on *S. schweinfurthii* OLIVE & HIERN. in Uganda in Africa, and on *Sonchus* sp. in Ceylon. In the Canary Islands the rust is quite common on *S. oleraceus* and its var. *lacerus* WALL., but is more or less common also on various endemic species of the section *Dendrosonchus* WEBB, viz. *S. congestus* WILLD., *gummifer* LINK, *jacquinii* DC., *leptocephalus* CAST., *pinnatus* AIT.*), and *radicatus* AIT.; of these *S. radicatus* is the type host of *Puccinia pseudosphaeria* MONT., but also of *P. taganananensis* P. MAGN.; the latter rust already P. & H. SYDOW (1904, pp. 153—154) considered synonymous with *P. sonchi*. Of the above-mentioned Canarian hosts *S. congestus, gummifer, jacquinii* and *pinnatus* are new, found with the rust by the present author in 1954.

LAGERHEIM (1909, pp. 32—34) gives a locality list for *P. sonchi* and says that it "weist eine ausgeprägte maritim-alpine Verbreitung auf". Also with our present more extensive knowledge of its distribution this largely appears to hold good. It is common in the Mediterraneans, particularly in the more western parts, and in the Canary Islands (where it has been found on not less than 7 hosts) and is also known from Madeira. It extends northward largely in coastal areas to Scotland, Northwest Germany, Denmark (here on *S. arvensis, asper* and *palustris)*, Southwest Norway (found once, viz. in 1954 at Lista on *S. arvensis)*, South Sweden, Öland and Gothland (in Sweden on *S. arvensis)*; it is also reported from the Leningrad District, viz. on *S. oleraceus* (IWANOW 1900, p. 16), but is not listed from here by TRANZSCHEL (1939, p. 376). It seems to be lacking in the central European lowlands, but inhabits the more southern European mountains from France eastward to the Carpathians and Balkans. From South

*) *S. pinnatus* also occurs in Madeira, where to my knowledge the rust has been found on *S. oleraceus* only.



Distribution of *Peristemma pseudosphaeria.*

Russia and the Near Orient it extends eastward into West Siberia, Russian Central Asia and the Northwest Himalayas, but it has also an area of distribution in East Asia. It is also reported from South India (on *Launaea),* Ceylon (probably introduced), New Zealand (introduced), and from Uganda (here on a native host). It is thus seen, that the rust does not extend as far towards north as some of its hosts, and also avoids the more continental lowlands of central Europe. Apparently no other rust has a similar distribution, but *Puccinia virgae-aureae* (DC.) LIB., on *Solidago,* resembles it in so far as it inhabits the coastal lowlands of West Europe, but not the more continental lowlands of central Europe; it also occurs in the more southern European mountains, but differs from *Peristemma pseudosphaeria* in extending much farther towards north, chiefly in subalpine areas, while it is totally absent from the Mediterranean lowlands. However, in the subalpine areas of North Europe species of *Sonchus* are practically lacking, while on the other hand *Solidago* is often scarce in the Mediterranean lowlands and may be absent; in the Canary Islands it is lacking. The present author has elsewhere (JØRSTAD 1948, p. 26) tried to explain the peculiar European distribution of *P. virgae-aureae* by assuming that infection in spring is possible in

coastal areas with mild winters, and also in areas with a heavy snow-cover that melts late, after warm weather having set in, but that infection is hampered in areas with cold winters without snow or with little snow melting early, as e. g. in the coastal areas of West Norway and in the continental lowlands of Germany. Possibly a similar reasoning is applicable also to *Peristemma pseudosphaeria;* in this connection it should hardly make much difference that *P. virgae-aureae* is a non-leptosporic microform, but *Peristemma pseudosphaeria* a brachyform, consequently possessing a uredo-generation.

REFERENCES

Butler, E. J. & Bisby, G. R.: The fungi of India. — Imp. Counc. Agric. Res., Monogr. 1. Calcutta 1931 (237 pp.).

Grove, W. B.: The British rust fungi (Uredinales). — Cambridge 1913 (412 pp.)

Iwanow, K. S.: Parazitnye griby v okrestnostsjach S.-Peterburga letom 1898 goda. — Trav. Soc. Imp. Natural. St. Petersb., 30, Fasc. 3, Sect. Bot., pp. 1—20, 1900.

Jørstad, I.: Microcyclic Uredineae on Geranium and Solidago. — Nytt Mag. Naturv. 86: 1—30, 1948.

Kuhnholtz-Lordat, G.: Les Urédinées corbiculées. — Bull. Acad. Sci. Lett. Montpellier, 1941 (Reprint, 2 pp.)

Lagerheim, G.: Verzeichnis von parasitischen Pilzen aus Södermanland und Bohuslän. — Sv. Bot. Tidskr. 1: 18—40, 1909.

Lamb, I.: Entwicklungsgeschichtliche Untersuchung einer morphologisch abweichenden Puccinia-Art (Pucc. Sonchi Rob.) — Hedwigia 74: 181—194, 1934.

Magnus, P.: Über einige von J. Bornmüller im Jahre 1900 auf den canarischen Inseln gesammelte Uredineen. — Ber. D. Bot. Gesellsch. 19: 292—300, 1901.

Sydow, H.: Die Verwertung der Verwandtschaftverhältnisse und des gegenwärtigen Entwicklungsganges zur Umgrenzung der Gattungen bei den Uredineen. — Annal. Mycol. 19: 161—175, 1921.

Sydow, H. & P. & Butler, E. J.: Fungi Indiae orientalis. Pars II. — Annal. Mycol. 5: 485—515, 1907.

Sydow, P. & H.: Monographia Uredinearum. I. Genus Puccinia. — Lipsiae 1904 (972 pp.)

Thirumalachar, M. J.: Some noteworthy rusts. II. — Mycologia 39: 231—248, 1947.

Tranzschel, W.: Conspectus Uredinalium URSS. — Mosqua & Leningrad 1939 (426 pp.).

Trotter, A.: Basidiomycetes. — Saccardo, Sylloge Fungorum 23. — Abellini. 1925 (1026 pp.)

Oslo, January 1956.

BEITRÄGE ZUR PILZFLORA JÜTLANDS

Von AXEL B. KLINGE

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1. Hirneola auricula Judae (L.) Berk. Diese Art ist von mehreren Standorten an der Ostküste Djurslands bekannt, wo der Pilz recht zahlreich auf *Sambucus nigra* vorkommt, so z. B. bei Elsegaarde und Blushøj, 12.4.1953 (neuer Fundort), sowie in den Rugaard-Wäldern (Friesia 3: 69—70, 1944.). Wenn der Pilz wieder vom letzteren Fundort erwähnt wird, liegt es daran, dass ich ihn am 2.6.1952 auf einem neuen Wirt fand, nämlich auf abgefallenen Zweigen von *Fagus silvatica* (Friesia 4: 347, 1953).

2. Cytidia flocculenta (Fr.) v. Höhn et Litsch. (Fig. 1). In Spalten eines umgestürzten, teilweise entrindeten Stammes von *Populus alba*. Gesellschaftlicher Wuchs. Der Pilz scheint an *Populus*-Arten geknüpft zu sein, ist aber hier in Dänemark selten. Am Strande bei Rugaard, Djursland, 16. 10. 1955. — Ein früherer Fund aus Jütland liegt vor, nämlich Hammer Bakker bei Aalborg, 1935 auf *Populus tremula*, leg. Poul Larsen.

3. Hydnum coralloides Scop. Auf Stämmen von *Fagus silvatica*. Wälder bei Fussingø bei Randers, im Troldeskov-Gebiet, 6.11. 1955.

4. Boletus versicolor Rostk. Hut kirschrot. Die Fruchtkörper wachsen bündelweise im Grase an Waldwegen oder an Grabenrändern a u s s e r h a l b des Waldes.

Wald bei Østrup, Randers, 13. 8. 1949.

Wald bei Hungstrup, Randers, 18. 9. 1948.

Am Grabenrand an der Landstrasse Randers—Grenaa in der Nähe der Løvenholm-Wälder 31 km östlich der Stadt Randers, 3.9.1951.

Krabbesholm bei Skive am Grabenrand, 5. 9. 1955.

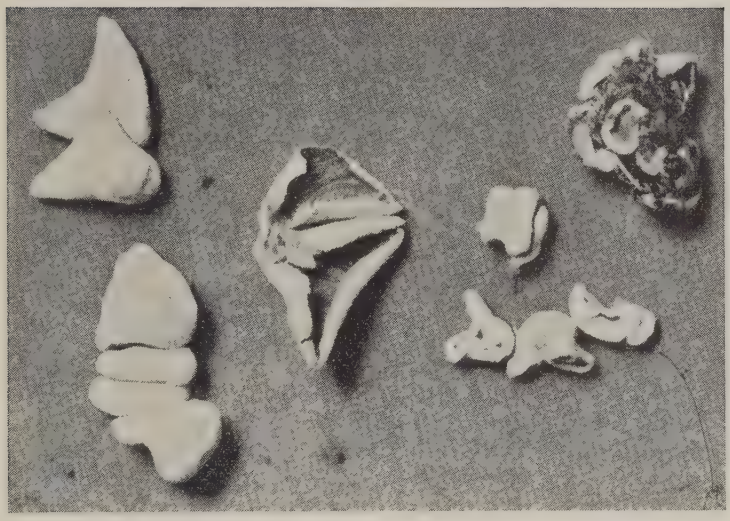


Fig. 1. *Cytidia flocculenta* (Fr.) v. Höhn et Litsch.
Rugaard Strand, Djursland, auf *Populus alba*, 16. 10. 1955.
Links: Fruchtkörper in feuchten Perioden. In der Mitte: Fruchtkörper von unten gesehen, so dass man das faltig-geaderte Hymenium sieht. Rechts: Zusammengerollte Fruchtkörper in trockenen Perioden.

5. Collybia racemosa (Pers.) Fr. Hut 0,3 cm, aschgrau, Stiel 4—6 cm, Wurzelfasern treibend, von der Basis aufwärts mit zahlreichen abstehenden, zerstreuten Haaren versehen, die oft rudimentäre Hüte tragen. Wald bei Eskær, Tolne, 25.9.1955. In der modernden Laubschicht unter *Fagus silvatica*. 6 Fruchtkörper, von denen zwei mit einem schwarzen, rundlichen Sclerotium verknüpft waren.

6. Dictyophora duplicata (Bosc.) Ed. Fisch. Ein Individuum unter *Fagus silvatica* am Fusse des Hügels „Knøsen", Dronninglund Storskov, 10.9.1950.

7. Geaster nanus Pers. Zwischen Flechten und Moos auf älteren Strandwällen mit einer Pflanzendecke aus *Hieracium pilosella, Trifolium arvense, Veronica spicata, Saxifraga granulata* und *Festuca ovina* bestehend. Sporen rund, 4,5—6 μ im Diameter. Capillitienfäden 5—7 μ breit. Rugaard Strand beim Kalkbruch Glatved südlich von Grenaa, 25.11.1951.

8. Ciboria Sydowiana (Rehm) Rehm. Auf Blattnerven und Blattstielen vorjähriger Blätter von *Quercus robur*. Ascosporen 11,7× 6,5 μ. Asci 115—130×8,5—9,0 μ. Hügellandschaft, Læsten bei Randers, 1.8.1954. Die Art ist ein Mal früher in Dänemark beobachtet, nämlich auf Seeland 1914, leg. O. Rostrup (Friesia 3: 277—278, 1947).

9. Sclerotinia ficariae Rehm. Auf sclerotisierten Wurzelknollen von *Ficaria verna*. Apothecien hellbraun. Stiel dunkler braun, haarfein. Fruchtscheibe 2—5 mm breit; der Stiel 1—15 mm lang, je nach der Tiefenlage des Sclerotiums in der Erde. Ascosporen 12,5—15×4,5 —6,5 μ. Laut N. Fabritius Buchwald: Sclerotiniaceae Daniae (Friesia 3: 312, 1947) ist *Sclerotinia ficariae* nicht in Dänemark nachgewiesen; aber seit 1951 habe ich den Pilz an verschiedenen Standorten der Randersgegend sowie bei Mariager gefunden. Nicht allzu dichte *Ficaria*-Bestände auf feuchtem, lockerem Boden bieten dem Pilze die besten Bedingungen. Ist der *Ficaria*-Teppich zu dicht, suche man am Rande des Bestandes oder wo Bäume oder andere Vegetation den Teppich unterbrechen. Die Apothecien erreichen ihre Vollreife während der Blütezeit der *Ficaria*-Pflanzen und etwa acht Tage später. Die Fruchtkörper können dann so zahlreich sein, dass sie in Form von Sporenwolken ihre Anwesenheit verraten, wenn man die Finger durch den Teppich gleiten lässt. Sclerotien, die in der Erdoberfläche liegen, können von fast sitzenden Apothecien ganz bedeckt sein. Die Sclerotien sind sehr verschieden geformt. Auf steifem Lehmboden sind sie länglich, oft schwach gekrümmt, zugespitzt 3—5×1—2 mm, während sie auf lockerem, feuchtem Boden öfter länglich-knollenförmig sind und eben die schwammige Konsistenz haben, die man bei *Sclerotinia tuberosa* kennt, aber die Grösse übersteigt wohl kaum 6 mm. Die sclerotisierten Wurzelknollen der *Ficaria verna* findet man Ende Juni, und sie sind zu dem Zeitpunkt im Innern rosafarbig unter einer äusseren schwarzen Rindenschicht.

Wald bei Haslund, Randers, 22. 4. 1951. — 28. 4. 1951.

Wald bei Mygind, Randers, 29. 4. 1951.

Wälder bei Fussingø, Randers, 3.5.1951. — 7.5.1955 Massenvorkommen.

Marenmølle bei Mariager, 13.5. 1951 Massenvorkommen. — 29. 7. 1951 Sclerotien. — 26. 4. 1952. — 9. 5. 1952. — 29.6. 1952 Sclerotien.

Wald bei Ulstrup, Randers, 6. 5. 1951.

Wald bei Østrup, Randers, 1. 5. 1955.

Wälder bei Bidstrup, Laurbjerg, 8. 5. 1955.

10. Myriosclerotinia Duriaeana (Tul.) Buchw. Auf vorjährigen, fast vom Wasser aufgelösten Stängeln von *Carex acutiformis*. Ascosporen 13 / 5,2 μ. Asci 130—140 / 7—9 μ. Sclerotien spindelförmig, schwach gesäumt, dicht und deutlich gestreift, mit 1—2 Apothecien.

Wald bei Toholt, Langaa, im Sumpfwald auf *Carex acutiformis*, 22. 5. 1955.

In einem *Carex*-Sumpf auf vorjährigen Stängeln einer *Carex* sp., der *Homostachyae-Vigneae*-Gruppe angehörig (*C. disticha?*). Sclerotien mit 1—3 Apothecien. Moor bei Læsten, Randers, 28.5.1955.

Die gürtelweise gestellten Mikrosporodochien, die man Ende Juni sollte beobachten können, habe ich nicht nachgewiesen.

11. Rhizina inflata (Schaeff.) Karst. Auf Brandstätten zusammen mit *Flammula carbonaria, Geopyxis carbonaria* sowie zahlreichen *Collybia ambusta*. Wald bei Ulstrup, Randers, 25.9.1955.

12. Hypocrea alutacea (Pers.) Tul. Wenige Individuen auf einem Erdwall (Waldeinfriedigungswall) unter *Corylus avellana* zu-

Fig. 2. *Hypocreopsis lichenoides* (Tode) Seaver auf *Corylus avellana*.
Wald bei Østrup, Randers, 13. 11. 1955.
Man bemerke, wie der handförmige Pilz die Unterlage mit seinen »Fingern« umfasst.

sammen mit zahlreichen *Spathularia flavida*. Wald bei Gjerrild, Djursland, 26.7.1953.

13. Hypocreopsis lichenoides (Tode) Seaver (Fig. 2). Nach J. Lind, Danish Fungi (1913) soll E. Rostrup am 31. 12. 1864 den Pilz auf *Corylus* gesammelt haben. In den späteren Jahren habe ich den Pilz an verschiedenen Standorten notiert, aber in keinem Falle waren Ascosporen gebildet. Der kanelartige Belag auf den Fruchtkörpern besteht aus Nebensporen. (Petch in Trans. Brit. Myc. Soc. 21: 288, 1938).

Hügellandschaft bei Læsten, Randers, 1. 8. 1954 auf Zweigen von *Sorbus aucuparia*.

Moor bei Læsten, Randers, 11. 4. 1955 auf Zweigen von *Salix aurita* und vorjährigen Stängeln von *Chamaenerium*.

Klørup bei Randers, 3. 4. 1955 auf *Salix caprea* und *Picea canadensis*.

Kaas, im westlichen Salling, 27.7.1955 auf *Corylus avellana* und *Lonicera periclymenum*.

Wald bei Østrup, Randers, 13.11.1955 auf *Corylus avellana*.

Weiter habe ich 1955 Material aus der Gegend bei Ribe (leg. Lennart Edelberg) erhalten.

14. Daldinia tuberosa (Scop.) Schroet. Auf abgefallenen Zweigen eines Laubbaumes *(Fagus?)*, Rugaard Sønderskov, Djursland, 6. 6. 1943.

Ein Massenvorkommen in einem Erlensumpf auf abgefallenen Zweigen von *Alnus glutinosa*. Wälder bei Fussingø, Randers, 6. 11. 1955.

Randers, Dänemark, Februar 1956.

PYRENOMYCETES PARASITIC ON HYPOGEOUS FUNGI

By MORTEN LANGE

Two members of *Clavicipitales,* viz. *Cordyceps capitata* and *C. ophioglossoides* range with *Nyctalis* among the most well known fungi parasitic on other fungi. They inhabit various species of the *Elaphomyces granulatus* group. *C. ophioglossoides* is not uncommon in Denmark; I have noted it on *Elaphomyces muricatus, E. variegatus,* and *E. granulatus* coll. *C. capitata* is much less frequent and have been found but a few times in this country. I have collected it in Grib Skov *(Elaphomyces variegatus,* Sept. 27, 1945), Tisvilde Hegn *(E. granulatus* coll., Oct. 14, 1945 and later years), Frederiksdal Skov *(E. variegatus,* Aug. 10, 1952), and Rude Skov *(E. variegatus,* Aug. 18, 1952 and later years).*)

There are, however, at least three other "pyrenomycetes" which are known to occur on hypogeous fungi. During my study of Danish hypogeas (LANGE, 1956), I have encountered these three species; two of them have not previously been found in Denmark, while the third has only been met with on epigeous hosts. *Hypomyces chrysospermus* was found on *Arcangeliella asterosperma, Battarrina inclusa* grew in the gleba of *Tuber puberulum,* while *Melanospora ornata* inhabited the gleba of *Elaphomyces asperulus.* All three species belong in *Hypocreales,* although the one of them, *Battarrina,* is very reduced, and finally may be placed somewhere else.

*) A third species with the same biology, *Cordyceps intermedia* IMAI, has not yet been found in Denmark. It is sometimes considered a hybrid, as it in all characters is intermediary between *C. ophioglossoides* and *C. capitata.*

1. Battarrina inclusa (Berk. & Br.) Clem. & Shear

Perithecia globose to ovate, 150—300 μ broad; wall thin, of 2—3 layers of subhyaline hyphae, 4 μ broad; without neck or distinct apical opening; hymenium developed on all sides, the asci radiating towards centre or sometimes towards sterile part of "top" of perithecium; paraphyses numerous, 1 μ thick, flexuose, hyaline, ends free; asci clavate-sackshaped, at first with spores irregularly uniseriate, distinctly uniseriate when ripe, and asci then subcylindric-curved, 30—40 $\times$ 4 μ, thinwalled, apex slightly thickened, but no pore seen, not coloured in Iodine; spores globose, hyaline, 4 μ broad, some very mature spores distinctly spiny from hyaline, short spines, others covered by distinct epispore; ripe spores discharged into perithecium, which becomes filled with spores at maturity.

Perithecia scattered in fertile part of gleba of *Tuber puberulum,* none seen in veins or in peridium.

Sjælland, Rude Skov, Aug. 20, 1952 (ML4200).

Hawker (1955) has made a renewed study of this rare species, and found the spores to be spiny. The spore structure seems, however, somewhat intrigueing. Petch (1938) found the spores with an utricle, which Hawker considers an artifact, but in the present specimen I have seen fully ripe spores without spines and other spores, not yet discharged from the ascus, with distinct spines. Some of the spineless spores had a distinct utricle.

The species seems restricted to *Tuber puberulum* (and its very close relatives). All Berkeley & Broome's material is from this host (cp. Petch, 1938) and so is Hawker's find, while Tulasne (1851) found the species in the closely related *Tuber borchii.* The present collection was made up of four fruit bodies of *T. puberulum,* all infected with *Battarrina,* while a fruit body of *Tuber rufum,* found on the same spot, was totally uninfected.

No very young perithecia were observed. There is, however, some indication that the perithecia are formed inside the young asci. This is in accordance with the fact, that no perithecia are seen outside the fertile part of the gleba.

2. Melanospora ornata Zukal

Perithecia solitary or in small groups, 100—300 μ broad, globose or slightly flattened at base, with very low neck, surrounded by few, hyaline setae or sometimes naked; tissue subhyaline when young, then yellowish brown, translucent; outer 2—3 layers of large, almost

isodiametric cells, inner part of 2—3 rows of more narrow cells; asci forming cluster in bottom of perithecium; paraphyses not seen; setae pointed, 25—40 μ long, base more or less inflated, up to 10 μ broad; asci clavate, short, stipitate, very thinwalled, 50×12—25 μ, 7—8 spored, spores irregularly arranged; ascus wall bursting before the spores are fully mature, no special apical structure, not coloured by Iodine; spores 17.5—20.5×9.5—12.5 μ, lemon-shaped, snout-like protracted with germ pore in both ends, flattened, almost cigar-shaped in side view; distinctly reticulate, reticulum with wide, irregular, low meshes; dark brown when fully mature, but long remaining hyalin.

Mycelium hyaline, a few hyphae springing from peridium.

Numerous perithecia scattered in half mature gleba of *Elaphomyces asperulus,* Jylland, Munkebjerg by Vejle, Aug. 22, 1940, leg. J. E. & M. Lange.

The genus *Melanospora* has recently been monographed by Doguet (1955), who divides the genus in several groups, using spore characters as main criterion. A small group (four species) is characterized by reticulate spores, but these species seem to be rare. None of them are mentioned by von Arx & Müller (1954), and Petch (1938) reports but one of them, *M. episphaeria* Phill. & Plowr. from England. It differs from the present species through much larger spores and lack of setae. Zukal found *Melanospora ornata* growing on *Polyporus zonatus,* while Doguet reports it from *Elaphomyces* (France) and from soil with *Fusarium* (Holland, Madagascar), Doguet's description covers my plant exactly, while Zukal gives somewhat smaller spores (14—15×10—11 μ).

Doguet mentions no differences between his specimens from *Elaphomyces* and from soil. It should, however, be further studied, whether the plant occurring on *Elaphomyces* represents a distinct taxon.

Another species of *Melanospora, M. zobelii* (Corda) Fuck. is recorded from *Tuber* sp. (cp. Petch, 1938), but is more frequently found on fruit bodies of *Sepultaria* (cp. Lange & Hansen, 1950).

3. Hypomyces chrysospermus Tul.

The imperfect stage of this fungus, *Sepedonium chrysospermum* Fr., is frequently found on *Boletus* spp. and *Paxillus involutus.* Tulasne (1860) gives also *Melanogaster* and *Arcangeliella (Octaviania)* as hosts, and Hawker (1955) has recently found it on *Melanogaster* and on *Rhizopogon,* while records from *Arcangeliella*

are very few (SCHROETER, 1908). Older records from *Scleroderma* needs confirmation, especially as *Boletus parasiticus* could have been the true host, without this being noticed.

The perfect stage, *Hypomyces chrysospermus* TUL., is rarely found, and has, as far as I know, only been encountered on *Boletus* and *Paxillus*. The Danish finds of the perfect stage are all from *Boletus*.

All Danish collections of *Rhizopogon, Melanogaster* and *Arcangeliella asterosperma* have been examined for *Hypomyces*-attacks. The result was negative for *Melanogaster* and *Rhizopogon,* but three collections of *Arcangeliella asterosperma* had distinct yellow crusts with chlamydospores of the *Sepedonium*-stage. One collection (ML4601, Sjælland, Jægersborg Dyrehave, Oct. 3, 1955, very strongly decayed) had only chlamydospores; another collection (ML4032, Sjælland, Pramskov, Vallø, Sept. 9, 1951) had young chlamydospores, and very well developed, hyaline, elliptic conidia. The third specimen (ML4199, Sjælland, Rude Skov, Aug. 20, 1952) was very strongly infected, the whole fruit body covered by yellow chlamydospores, which also developed in the surrounding soil. The gleba was, however, normally developed, with mature spores, and the peridium only slightly collapsed. Numerous perithecia were imbedded in the peridium; they were globose, up to 300 μ broad, pale yellowish brown, and hyaline, with a wall of 3 layers of thinwalled cells. The ascogonial hyphae were developed in the central part of the larger perithecia, while no asci were formed as yet.

LITERATURE

von Arx, J. A. & E. Müller, 1954: Die Gattungen der amerosporen Pyrenomyceten. — Beitr. Kryptogamenflora Schweiz 11, 1.

Doguet, G., 1955: Le genre Melanospora: biologie, morphologie, développement, systématique. — Le Botaniste 39: 1—313.

Hawker, L. E., 1955: Hypogeous fungi V. Two fungal parasites of hypogeous fruit bodies. — Trans. Brit. Myc. Soc. 38: 75—77.

Lange, M., 1956: Danish hypogeous Macromycetes. — D. Bot. Ark. 16, 1.

— **& E. Bille Hansen,** 1950: Notes on Danish Fungi. — Friesia 4: 61—65.

Petch, T., 1938: British Hypocreales. — Trans. Brit. Myc. Soc. 21: 243—305.

Schroeter, J., 1908: Die Pilze Schlesiens. Zweite Hälfte.

Tulasne, L. R. & C., 1851: Fungi hypogei.

— 1860: De quelques sphéries fongicoles. — Ann. Sci. Nat. (Bot.) IV, 13: 5—19.

Copenhagen, February 1956.

QUELQUES LEPIOTES NOUVELLES OU CRITIQUES

LEPIOTA HELVEOLA Bres. ss. Josserand, L. SERICIFERA (Locq.) Locq. et L. KÜHNERIANA sp. nov.

par MARCEL LOCQUIN

Des trois espèces décrites ci-après, l'une est nouvelle, l'autre rare, la troisième mal connue bien que toxique. Elles appartiennent toutes les trois au genre *Lepiota,* florissant au Danemark, puisque c'est dans la Flora Agaricina Danica, de J. E. Lange que se trouve la source de toutes les études modernes sur ce genre.

1. Lepiota helveola Bres. ss. Josserand.

Nous redonnons une description détaillée de cette espèce toxique souvent méconnue car nous la connaissons bien de nombreuses stations différentes.

Nombreuses récoltes dans les régions: Lyonnaise, Alsacienne et Parisienne, sous feuillus ou au bord des haies. Septembre-Octobre.

Chapeau: (D = 20—35 mm) arrondi, puis convexe, puis étalé, plus ou moins régulier, non mamelonné; revêtement séparable, densément velouté-hispide au disque chez le jeune, puis rompu diffracté en mèches de taille et de forme très irrégulière, ocre briqueté, ocracé lie de vin, sur le fond rose ocré ou rose incarnat de la chair; marge incurvée puis droite, régulière, à peine plus pâle et moins ornée; chair cassante, peu épaisse, blanche, rosissant à peine; odeur suave puis de lépiote; saveur fongique.

Pied: (H = 35—40 mm; d = 4—5 mm) non séparable, assez trapu, cylindracé; chair à cortex miel hyalin, puis pelure oignon, blanche en profondeur; moelle blanche; revêtement supère blanc

soyeux puis à peine rosé, infère ocré, moucheté çà et là de flocons pelucheux du voile général; rosissant intensément au toucher; voile cortiniforme avec une zone de bourrelets annuliformes à peine marquée, brun rosés; bulbe plein à peine indiqué.

Lamelles: larges, fragiles, peu épaisses, non séparables, libres (1—3 l; 2 λ) peu espacées, blanc glauquescent; arête entière aiguë, concolore; extrémités arrondies.

Mycélium: blanc.

Sporée: blanc-crème très pâle.

Revêtement piléique: sur un lacis d'hyphes filamenteuses s'élèvent des poils cylindracés-flexueux, obtus, non cloisonnés, bouclés à la base; pigment de membrane.

Trame: vésiculeuse-onduleuse, à peu près régulière; sous-hyménium celluleux.

Arête: homomorphe.

Spores: brun-rouges dans le Melzer; elliptiques à elliptico-cylindracées $\frac{5}{3,5} — \frac{6,5}{4}$ μ.

Observations: Bien que la chair de cette espèce soit nettement rosissante à la cassure, il s'agit de la *L. helveola* décrite et figurée par M. Josserand. La planche de cet auteur est mal venue au tirage et la teinte rose en est malheureusement absente.

2. Lepiota sericifera (Locq.) Locq.

L. cristata (A. et S.) v. *sericea* Cool.
L. serena Lange, non Kühner.
L. sericea Huysman 1943, non Massee 1912.
Pseudobaeospora sericifera Locquin 1952.
Lepiota sericata Kühner et Romagnesi 1953.

Bois de Vincennes — Septembre sous feuillus. Une récolte, rare.

Chapeau: (D = 25—30 mm) conico-convexe, faiblement mamelonné, à marge droite; revêtement finement soyeux-méchuleux radialement, uni ou disque qui est blanc, puis brunâtre pâle, clair, clair vers la marge qui est régulière, à peine excoriée par places, fibrillo-soyeuse, blanchâtre; chair assez ferme, peu épaisse blanche; odeur faible de Lépiote.

Pied: (H = 50—60; d=2) difficilement séparable, cylindracé, renflé en massue progressive à la base; chair blanche; moelle blanche;

revêtement supère uni blanc; infère soyeux blanc; voile partiel en forme d'anneau ou en entonnoir, supère, à bord finement pointillé de jaunâtre, blanc jaunissant au contact faiblement.

Lamelles: allongées, fragiles, peu épaisses, insérées sur un large collarium (1—2 l; $\lambda\infty$) assez serrées, blanches, puis blanchâtres, faces planes; arête finement érodée blanche; extrémités tronquées intérieurement.

Mycélium: blanc.

Revêtement piléique: à hyphes filamenteuses radiales, plus grêles que celles de la chair sous-jacente; pigment de membrane.

Revêtement du pied: analogue.

Trame des lames: subrégulière.

Basides: tétrasporiques claviformes.

Arête des lames: stérile à cellules cylindracées ou fusiformes, très développées, prolongées parfois par un bec long, plus ou moins capité.

Spores: subamygdaliformes $\frac{6}{4} — \frac{9}{4,5}$ μ.

Boucles: non vues.

Observations: Cette espèce, décrite par J. E. Lange sous le nom de *L. serena,* puis par Huysman qui le premier a reconnu son indépendance vis à vis de cette espèce sous le nom de *L. sericea* Cool, nom préoccupé par une espèce différente de Massee (1912), se distingue de sa proche voisine *L. serena* par son port différent et ses poils d'arête très développés.

Son nom légal est *L. sericifera* (Locq.) Locq. (1952).

3. Lepiota Kühneriana sp. nov.

Isolés ou connés dans l'herbe ou dans les haies.

Région Lyonnaise, Octobre.

Chapeau: (D = 20—40 mm) globuleux, puis hémisphérique, enfin étalé, mamelon peu ou pas indiqué au disque; revêtement finement méchuleux, hérissé de fines écailles brun rouge dressées sur le jeune, persistant longtemps sur le disque de l'adulte, densément rompu ailleurs vers la marge en fins granules punctiformes, plus pâle à la marge qui est un peu débordante, cotonneuse, blanchâtre; chair cassante, blanche puis brunâtre; à odeur faible de *L. cristata;* saveur faible douce.

Pied: (H = 30—50 mm; d = 2—4 mm) séparable, creux, à moelle blanche; chair paille pâle, immuable; revêtement fibrilleux cotonneux au sommet où il est blanc brunâtre, chaussé à la base de quelques flocons épars brunâtres formant des bracelets brisés réunis par un tomentum blanchâtre cortiniforme mais sans anneau, se tachant un peu de jaunâtre à la base au froissement, virant ensuite au brunâtre.

Lamelles: assez espacées (1—3 l; $\lambda\infty$), ventrues, libres; extrémités aiguës; arête finement crènelée, concolore; faces brunâtre pâle; brunissant tardivement ou au contact.

Sporée: blanc (crème).

Revêtement piléique: à longs poils obtus, non septés, à pigment de membrane avec quelques hyphes pyriformes à leur base mais n'esquissant pas de cuticule hyméniforme.

Hyphes: bouclées.

Trame: subrégulière.

Basides: tétrasporiques claviformes.

Arête: entièrement stérile, à poils obtus, un peu renflés.

Spores: subfusiformes mais relativement courtes; arête interne parfois légèrement ventrue: $\frac{10}{5} — \frac{11}{5,5} — \frac{12}{5,5}\ \mu$.

Observations: Cette espèce est bien caractérisée par les fines mèchèles dressées et persistantes à la surface du chapeau et ses spores fusiformes mais relativement courtes. Je la dédie à R. KÜHNER en compagnie de qui je l'ai récoltée.

DIAGNOSE LATINE

Lepiota Kühneriana LOCQ., Sect. *Clypeolariae.*

Pileo 20—40 mm lato, disco cum squamulis erectis; lateritio tincto. Stipite cortinato gaussapato. Lamellis brunnescentis. Sporis 10—12×5—5,5 μ, fusiformis. Hyphis fibulatis.

INDEX BIBLIOGRAPHIQUE

Lange, J. E.: Flora Agaricina Danica. I. Copenhagen 1935.
Singer, R.: Agaricales. Lilloa. Tucuman 1949.
Kühner, R. et **H. Romagnesi:** Flore analytique des Champignons supérieurs. Paris 1953.
Locquin, M.: Bull. Soc. Myc. Fr. 68: 169, 1952.
— : Bull. Soc. Lin. Lyon — 1942, 1943, 1944, 1945 passim.
Josserand, M.: Bull. Soc. Myc. Fr. 47: 65, 1931.

Paris, février 1956.

SPOROBOLOMYCES AND OTHER YEASTS ON GRAINS OF BARLEY

By AAGE LUND

Tuborg Breweries, Copenhagen.

The genus *Sporobolomyces,* together with *Bullera,* holds a special position among yeasts, due to its formation of the so-called ballistospores. These arise on sterigmata and, when ripe, are discharged by a drop-excretion mechanism. After KLUYVER & VAN NIEL (1925) called attention to the similarity between the spore-discharging mechanism in *Sporobolomyces* and in many *Basidiomycetes,* pointing out that *Sporobolomyces* might belong to the *Basidiomycetes,* many mycologists have associated themselves with this view. Others, however, regard the ballistospores as conidia and consequently include *Sporobolomyces* under *Fungi imperfecti.* However, it would seem more reasonable to regard the genus as belonging to the *Basidiomycetes.*

According to LODDER & KREGER-VAN RIJ (1952), 7 species of *Sporobolomyces* are known which have been isolated from leaves, flower nectar, soil, air, yeast, beer, etc. in various parts of the world. As far as the writer knows, this yeast has not so far been mentioned in the literature as having been found in either Denmark or, for that matter, in the rest of Scandinavia. However, it should be noted that one of the red yeasts pictured by E. CHR. HANSEN (1879, Tab. II, Figs. 1—37) must doubtless be regarded as a *Sporobolomyces**). This yeast, to which HANSEN gave no systematic designation, came from rose-coloured stains on some paste which he had left standing for a few days in the laboratory.

The discharge of spores in *Sporobolomyces salmonicolor* (F. et BR.) KL. et v. N. was examined by MÜLLER (1954) through a very instruc-

*) Presumably being the oldest drawing of *Sporobolomyces.*

tive film he had made. However, the culture which MÜLLER used for his investigations was of Dutch, not of Danish origin. Mr. E. BILLE-HANSEN, M. Sc., has informed the writer that in air analyses on agar plates he has found red yeasts which produced "mirror images" characteristic of spores discharged by *Sporobolomyces*.

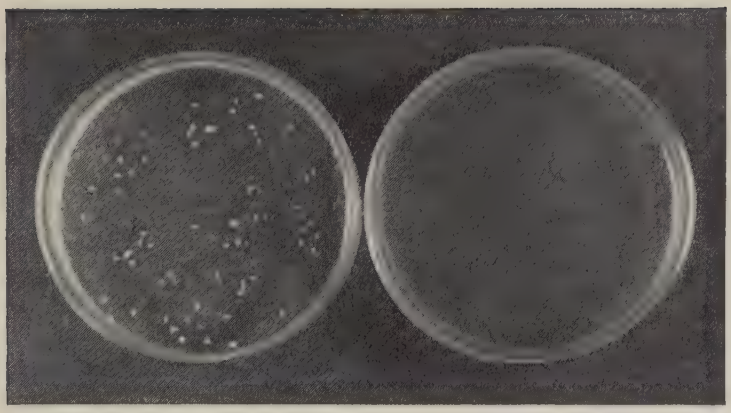
Recently, the writer found *Sporobolomyces* to occur commonly on grains of barley, and the idea readily suggests itself that it may occur, just as commonly on other vegetable matter in Denmark. DERX (1930) in the vicinity of Prague found *Sporobolomyces* on grains of barley and other cereals and also on straws and old leaves. Recently, LAST (1955) has shown *Sporobolomyces roseus* KL. et v. N. to occur commonly on old and dead leaves of barley and wheat in England. From these, moreover, he isolated a species of *Bullera*, the other ballistospore-forming yeast genus.

It may seem strange that *Sporobolomyces* was not observed in the writer's former investigations on yeasts on natural substrates (LUND 1954). This presumably is due to the fact that — as will be mentioned below — *Sporobolomyces* forms exceedingly small colonies with the method used and hence might be easily overlooked. The fact that it was found on barley was probably due to its being a dominant element of the yeast flora on such grains.

COUNTING AND ISOLATING YEASTS

In the very hot and dry summer of 1955, the yeast flora on grains of barley was examined. The investigations comprised barley-grain samples taken aseptically in sterile Petri dishes from the plants in two fields immediately before the harvest in August as well as samples of threshed barley taken immediately on its arrival at the Tuborg Breweries, Copenhagen.

From each sample, 10 healthy undamaged grains were transferred to 10 cc sterile water in which they stood for 30 minutes during which time they were subjected to repeated vigorous shaking. The shakings were then plated out on hopped wort agar to which 0,25% sodium propionate had been added. On this medium, the growth of moulds is inhibited while the development of yeasts as a rule is unaffected. The agar plates were permitted to stand at about 20^0 C for 3—4 days, whereupon the yeast colonies that were found were counted and converted into number of yeast cells per grain. The figures found give the amount of yeast cells present on the outside of the grains. Some

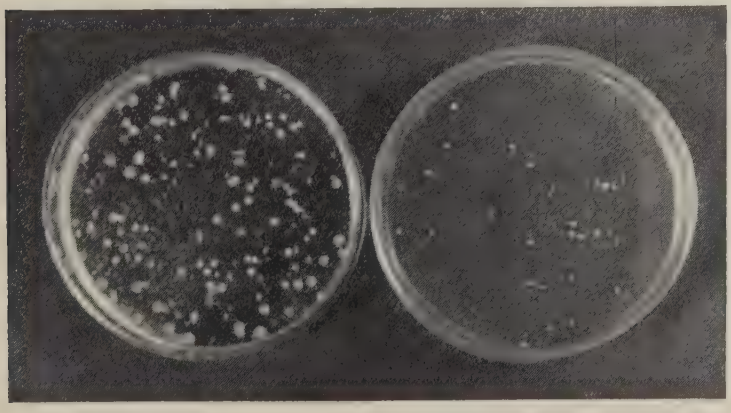


A B

Fig. 1. *Sporobolomyces* on agar plates at about 20° C.
A. Wort agar 3 days old. — B. Wort agar with 0,25% sodium propionate 3 days old (colonies hardly visible to the naked eye).

of the yeast colonies were transferred to wort agar slopes, and pure cultures were secured from these by repeated platings.

Sporobolomyces, unlike other yeasts examined by the writer, formed very small colonies on wort agar with sodium propionate, so that they could be counted only through a magnifying glass. In



A B

Fig. 2. *Sporobolomyces* on agar plates at about 20° C.
A. Wort agar 5 days old. — B. Wort agar with 0,25% sodium propionate 5 days old (colonies readily visible to the naked eye).

experiments with a pure culture, the yeast after 3 days at about 20° C formed readily visible colonies, frequently 1 mm in diameter, on wort agar (without sodium propionate). On the other hand, its colonies on wort agar + 0.25% sodium propionate under the same conditions were barely visible to the naked eye, measuring only 100—250 μ in diameter (Fig. 1). Only after 5 days' growth the colonies were readily visible on that medium (Fig. 2). However, in the examination of grains for yeasts the agar plates should be counted after 3—4 days, longer standing frequently resulting in extensive mould growth.

YEASTS ON BARLEY GRAINS

The results of yeast-cell counts on grains of barley are given in Table 1. It will be seen that yeasts were found in 14 out of the 17 samples (Nos. 1—17) taken on barley plants in two fields. They occurred in greatly varying numbers, all the way from very few to 3400 yeast cells per grain. Some of the samples contained so large amounts of yeast cells that the yeasts no doubt grew on the grains in question.

Table 1, moreover, shows that the samples of threshed barley behaved somewhat differently. Out of the 15 samples (Nos. 18—32) from 3 lots of barley that were examined, the presence of yeasts

Table 1.

Barley grains from fields			Barley grains on arrival at Tuborg		
Field	Sample no.	Number of yeast cells per grain.	Barley lot	Sample no.	Number of yeast cells per grain.
A	1	8	I	18	0
	2	13		19	0
	3	30		20	1
	4	41		21	3
	5	60		22	28
	6	160			
	7	750	II	23	0
				24	0
B	8	0		25	1
	9	0		26	1
	10	0		27	2
	11	1			
	12	1			
	13	80	III	28	0
	14	110		29	1
	15	900		30	1
	16	2600		31	3
	17	3400		32	7

was demonstrated in 10 samples but they occurred in small amounts only, from 1 to 28 yeast cells per grain.

Incidentally, somewhat similar findings were also made in regard to moulds. These occurred in large amounts in platings of the field samples, rendering the examination of yeast colonies exceedingly difficult. On the other hand, moulds occurred in much smaller amounts in platings of threshed barley, so that yeast analyses presented no difficulties. It would seem that large amounts of mould spores and yeast cells were removed in the threshing process.

A total of 36 isolates of yeasts from the barley samples were pure-cultured. 17 cultures of *Rhodotorula* and 11 of *Sporobolomyces* were isolated, the rest being distributed on *Hansenula* (3), *Torulopsis* (4), and *Candida* (1).

Sporobolomyces and the red *Rhodotorula* yeasts are very similar. The difference between them is that *Sporobolomyces* forms basidiospores while no perfect stage is known in *Rhodotorula*. According to MÜLLER (1954), the spores in *Sp. salmonicolor* are discharged to a distance of up to 0.4 mm in both the horizontal and vertical directions. To determine which of the red-coloured isolations belonged to

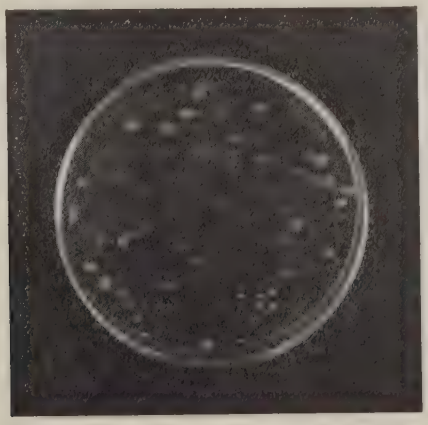


Fig. 3. "Mirror images" consisting of discharged spores from *Sporobolomyces* colonies on the lid of an inverted Petri dish.

Sporobolomyces, the isolates were inoculated on wort agar in Petri dishes and on wort agar slopes in tubes, both of which were placed with the layer of agar and the culture facing downwards. After 2—3

days at about 20° C "mirror images" consisting of discharged *Sporobolomyces* spores were formed in 11 of the red yeasts. No discharge of spores occurred in the other 17 red isolations, which were consequently regarded as belonging to *Rhodotorula.*

Future investigations, however, may show this distinction to be unjustified. As expressed by Lodder & Kreger-van Rij (1952), it seems very probable that at any rate certain *Rhodotorula* species must be regarded as asporogenous *Sporobolomyces* species.

SUMMARY

Sporobolomyces, together with *Rhodotorula,* was found to be a dominant element in the yeast flora on grains of barley in Denmark examined after the very hot and dry summer of 1955. On grains taken from barley plants immediately before the harvest, considerable amounts of yeast cells were often found. On the other hand, few yeast cells occurred in samples of threshed barley.

REFERENCES

Derx, H. G.: Étude sur les Sporobolomycètes. — Ann. Myc. 28: 1—23. 1930.

Hansen, E. Chr.: Organismer i Øl og Ølurt. Kjøbenhavn 1879.

Kluyver, A. J. & C. B. van Niel: Über Spiegelbilder erzeugende Hefenarten und die neue Hefengattung Sporobolomyces. — Centralbl. Bakteriologie II, 63: 1—20. 1925.

Last, F. T.: Seasonal incidence of Sporobolomyces on cereal leaves. — Trans. Brit. Myc. Soc. 38: 221—239. 1955.

Lodder, J. & N. J. W. Kreger-van Rij: The Yeasts. A taxonomic study. Amsterdam 1952.

Lund, A.: Studies on the ecology of yeasts. Copenhagen 1954.

Müller, D.: Die Abschleuderung der Sporen von Sporobolomyces — Spiegelhefe — gefilmt. — Friesia 5: 65—74. 1954.

Copenhagen, February 1956.

ON METASPHAERIA COCCODES (KARST.) SACC. AND OTHER FUNGI PROBABLY RELATED TO MASSARINA SACC. (MASSARINACEAE N. FAM.)

By ANDERS MUNK

In a previous paper (MUNK 1953) I with some doubt placed the genus *Massarina* SACC. together with *Massaria* DE NOT. and *Massariella* SPEG. Further investigations have revealed that *Massarina* is more related to other genera which I (1953) placed elsewhere in the system. The present paper is an attempt to clarify the problem of the relationship of *Massarina*. As a conclusion of the report the new family *Massarinaceae* is established.

The most elucidating investigation was the microscopic examination of a *Leptosphaeria*-like fungus with hyaline spores, growing on sheaths of grass. It is preserved in the herbarium of the Department of Plant Pathology of The Royal Veterinary and Agricultural College, Copenhagen. The specimen was collected at Dronninggaard Skov (Sealand) by OVE ROSTRUP and was labelled *Leptosphaeria anarithma* (BERK. & BR.); it seems to me that a better name for the fungus would be *Metasphaeria coccodes* (KARSTEN) SACC. (= *Leptosphaeria coccodes* KARSTEN). The fungus is distinctly related to *Massarina* and not to any group of *Leptosphaeria*. I shall make no attempt to discuss the generic name of this fungus; all other species of *Metasphaeria* examined by me, however, have appeared to belong to more or less well-defined genera with other names, and I think it is reasonable to use the name *Metasphaeria* for it (I am not aware that the genus *Metasphaeria* is so strictly typified as to forbid this procedure).

The present specimen of *Metasphaeria coccodes* (KARST.) SACC. can be described as follows:

Mycelium abundant, dematioid, hyphae 3—6 μ thick, septate, branched and anastomosing, often $\pm$ coalescent, brown; a dense cluster of nodulose, wavy, thick hyphae is often seen at the base of the pseudothecium.

Pseudothecia 300—450 μ diam., flattened-subspheric, hardly papillate, subepidermal, not prominent.

Peridium 13—15 μ thick, cells 8—12 μ diam., 4—6 μ thick, light brown, with irregularly distributed dark brown thickenings of the walls; the outside is covered by a definite black crust; a thin tissue round the indistinct porus is smaller-celled and very dark brown, almost opaque black.

Asci 70—80 × 10—12 μ, oblong, rather thick-walled, converging; interascicular tissue abundant, paraphysoid, filaments ca. 1 μ thick.

Spores densely crowded, 25—30 × 3—4 μ, fusiform, early 2-celled, constricted at the septum, later on indistinctly 4-celled, with four large oil-drops; hyaline. (One light brown, over-ripe spore with a punctate epispore has been observed).

The habitat of this remarkable fungus (together with its characteristic spores) makes it appear as a *Trichometasphaeria* at first glance. But it has no pointed hairs at all on the pseudothecium, and the peridium is not hyaline in the bottom. — Another possibility is the genus *Massarina;* in fact, the blackish, small-celled tissue at the porus is a strong indication of this relationship. The exact taxonomic position of the fungus must be made clear by further studies (which will, however, be difficult to make because it is certainly a rare species). It is very interesting in presenting mixed characters of *Trichometasphaeria* and *Massarina* together with an obviously very slight differentiation of the pseudothecium. I have for some time had the idea of a relationship between the two genera in question; the present species shows the very structure which one would construct as a hypothetic basic type for *Trichometasphaeria* and *Massarina.*

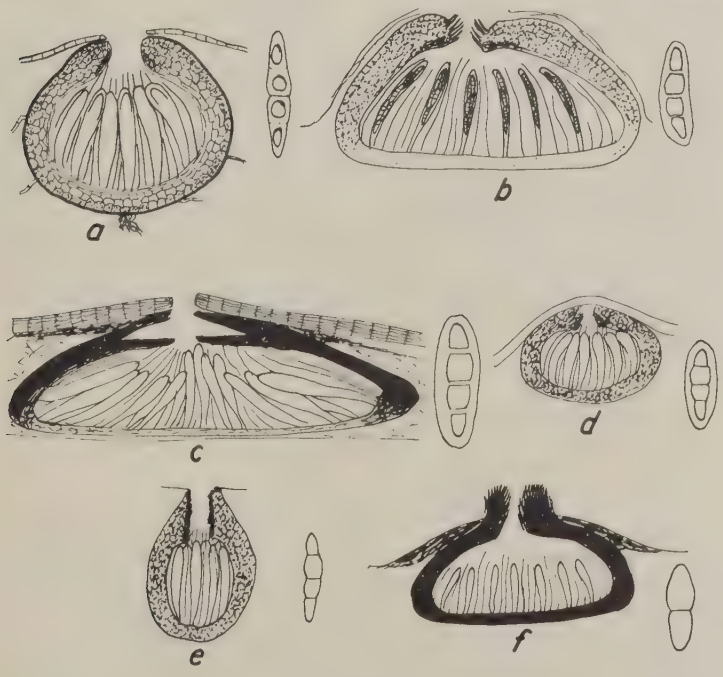
Certain other genera of bitunicate Pyrenomycetes present themselves for consideration of relationship with *Massarina,* viz. *Pseudotrichia* KIRSCHSTEIN and *Keissleriella* v. H. (Syn. *Coenosphaeria* MUNK 1953 : 133). *Pseudotrichia* is evidently related as shown by its black tissue in the porus and typical, somewhat narrow *Massarina*-spores. *Keissleriella* has a strong clypeus like certain species of *Massarina,* a papilla built like that of *Trichometasphaeria,* and a hypersaprophytic

ecology which reminds one of *Pseudotrichia;* its spores are somewhat atypical for the group; it seems probable that it belongs to the same taxon as the other genera mentioned here.

In my opinion the facts presented above justify the erection of the group to a new family, *Massarinaceae:*

Massarinaceae fam. n. (Genus typicum: *Massarina* SACC.).

Pseudotheciis non-stromaticis vel saepius clypeatis. Peridio textura prismatica, atro-brunneo, ad basim saepius subhyalino, ad porum obscuriore, parvicellulare (conum internum nigrum, vel pilos rigidos, atros, acutos saepe formante). — Ascis basalibus, bitunicatis; textura interasciculari paraphysiformi. — Ascosporis hyalinis, transversaliter septatis (2-cellularibus vel saepius 4-cellularibus vel ad 6—7-cellularibus), saepius strato tenui, mucoso, persistente obductis, ± distincte guttulatis, typice valde refringentibus.



Massarinaceae. Pseudothecia (× 95) and spores (a × 765, f × 930, b-e × 585). — a. *Metasphaeria coccodes.* — b. *Trichometasphaeria culmifida.* — c. *Massarina eburnea.* — d. *Massarina rubi.* — e. *Pseudotrichia minor.* — f. *Keissleriella sambuci.*

Pseudothecia generally clypeate, rarely without trace of a stroma. Peridium moderately thin, often hyaline in the bottom. The tissue around the porus shows a characteristic differentiation: The tissue immediately at the porus is small-celled and very dark-coloured, almost opaque black. In *Trichometasphaeria* and *Keissleriella* this tissue forms strict, black, spiny hairs in and immediately outside the porus. In *Massarina* and *Pseudotrichia* no hairs occur, but the black tissue is particularly differentiated from the rest of the peridium as a distinct cone (in *Massarina* spp.), a horizontal, perforated disc (180° cone, in *Massarina eburnea*), or a cylinder (0° cone, in *Pseudotrichia*). The basic type (an almost uniform peridium with a slight blackening and condensation around the porus) is actually observed in *Metasphaeria coccodes*.

The ecological aspect of the family is remarkably varied: *Trichometasphaeria* and *Metasphaeria coccodes* are saprophytes on herbaceous plants. *Keissleriella* is a hypersaprophyte, *Pseudotrichia* hypersaprophytes with a tendency towards real mycoparasitism. And *Massarina* spp. probably are corticolous saprophytes of first incidence on woody substrata. Thus, the pattern of variation in the structure of the papilla is traversed in various combinations by a pattern of variation in the ecological properties.

It is evident that the pattern of variation in this family shows no resemblance to any other pattern of variation in a group of *Pyrenomycetes*. Neither do I know transitions from other groups. Even the simple *Metasphaeria coccodes* shows a definite affinity to *Massarinaceae*.

The genera of *Massarinaceae* can be characterized as follows:

Metasphaeria Sacc. sensu restr.

Characterized on the basis of *Metasphaeria coccodes*, see above.

Trichometasphaeria Munk

Pseudothecia ± clypeate, flattened, immersed beneath the epiderm of the host-plant. Peridium composed of small and indistinct cells, often hyaline in the bottom, darker upwards, at the top rather thick, dark brown, especially towards the porus. Papilla flat and inconspicuous, outside and in the porus covered with dark brown bristles. Asci

cylindric-clavate, sessile, double-walled; interascicular tissue paraphysoid. Spores 1—2-seriate, transversally septate and constricted, hyaline, with strongly refractive contents, generally with a „gelatinous" outer wall of the epispore. — On herbaceous stems.

Species examined:

Trichometasphaeria dianthi (Rostr.) Munk (type species).
— *pentamera* sp. n. (Munk 1956, in press).
— *culmifida* (Karsten) comb. n. (*Leptosphaeria culmifida* Karsten).
— sp., cfr. *Leptosphaeria setulosa* Sacc. & Roum.

Massarina Sacc.

With a ± distinct clypeus-stroma coalescent with the upper portion of the peridium. Pseudothecia subspheric to flattened, in *M. eburnea* hyaline in the bottom, uniform in the other species; towards the porus the inner portion of the peridium is differentiated into an opaque blackish, small-celled tissue in the shape of a cone (in *M. eburnea* a flat disc). Asci clavate; interascicular tissue paraphysoid. Spores biseriate, transversally septate, hyaline, strongly refractive, constricted at the septa, outer epispore „gelatinous". — Corticolous.

Species examined:

Massarina eburnea (Tul.) Sacc. (type species).
— *salicinicola* Rehm.
— *micacea* (Kze.) Sacc.
— *polymorpha* (Rehm) Sacc.
— *alni* (Otth) Sacc.
— *rubi* (Fuck.) Sacc.

Pseudotrichia Kirschstein

Pseudothecia small, gregarious, immersed, vertically elongate. Peridium thin and soft; towards the porus the inner portion is differentiated as in *Massarina,* but the black tissue forms a cylinder instead of a cone. Asci cylindric-clavate; interascicular tissue paraphysoid. Spores biseriate, 2-, then 4-celled, strongly constricted at the primary septum, hyaline. — Hypersaprophytes, probably approaching real mycoparasitism.

Species examined:

Pseudotricha minor Munk.

Keissleriella v. H. (Syn.: *Coenosphaeria* Munk).

Pseudothecia immersed, but prominent, clypeate, Peridium small-celled. Papilla outside and in the porus covered with dark brown bristles. Asci clavate; interascicular tissue paraphysoid. Spores 1—2-seriate, clavate, bicellular, hyaline. — Hypersaprophytes on rotten wood.

(Dr. V. Arx has called my attention to the fact that my *Coenosphaeria diaporthides* (Munk 1953 : 134) seems to be identical with *Didymella sambuci* Reiim, which is the type species of *Keissleriella* v. H. My thanks are due to Dr. v. Arx for this valuable information).

Species examined:

Keissleriella sambuci (Rehm) v. H.

REFERENCES

Munk, A. (1953): The System of the Pyrenomycetes. 163 pp.

Munk, A. (1956): Danish Pyrenomycetes. A preliminary Flora. About 550 pp. (in press).

Copenhagen, February 1956.

LYCOGALA FLAVO-FUSCUM IN DENMARK

By D. MÜLLER

Until now the big but rather rare myxomycet *Lycogala flavo-fuscum* (Ehrenb.) Rost. has not been recorded from Denmark. It is neither mentioned in the monograph by RAUNKIÆR (1888) nor by ELLIOTT (1927) in his review of the Danish myxomycetes in the Botanical Museum of Copenhagen.

In Sweden it is mentioned from 4 localities by FRIES (1899); from Norway no finds have been published.

Fig. 1. *Lycogala flavo-fuscum.* Cluster of aethalia on *Aesculus hippocastanum.* Elsinore, 18. July 1955. Phot. by D. MÜLLER.

Fig. 2. *Lycogala flavo-fuscum*. Cluster of aethalia. Drawing executed from nature by Miss ELLEN BACKE. Nat. size.

In July 1953 I found two fruit bodies on an old hollow *Aesculus hippocastanum* in Elsinore. The fruit bodies sat at a height of about 1.5 m. In July 1955 I found some more fruit bodies on the same *Aesculus* as in 1953.

The fruit bodies (the aethalia) were silvery grey-shining, smooth, with numerous, small, darker spots enclosed by a network of brighter veins. The four biggest clusters of aethalia from 1955 had a fresh-weight of resp. 67, 38, 34 and 10 g. Together with two smaller aethalia the whole crop was 154 g fresh-weight. The biggest cluster of aethalia measured $8 \times 6 \times 4$ cm, the next $4.5 \times 5.5 \times 3$ cm.

The spores are grey, about 5.5μ, verrucose-spiny with a low reticulum between the spines.

The hypothallus had a yellow-ochraceus colour, a character mentioned by EHRENBERG (1818) but not since.

CEJP (1952) who mentions that *Lycogala flavo-fuscum* has been found in 6 localities in Czechoslovakia, says that this myxomycet normally occurs on *Acer*. But the Danish finds, and also some of those stated by CEJP, are not from *Acer*. He also mentions, that the prevalence is at the end of the summer or in the autumn. But in Denmark the aethalia ripen in July. The fruit bodies, which I gathered on the 18. July 1955, had ripened during the days from the 13. to the 18. July.

The Danish finds are the following four, all from Zealand:

1) Frederiksværk, the Arresödal Forest, on a stump. Spores 5.5—6.2 μ. July 1890. Leg. et det. E. ROSTRUP. At Laboratory of Plant Pathology, Royal Vetr. and Agric. College, Copenhagen.

2) Tisvilde, on *Aesculus hippocastanum* in the neighbourhood of the Sand-flight Monument. Spores 6.2—6.9 μ. 9. Sep. 1954. Leg. M. SKYTTE CHRISTIANSEN; det. M. P. CHRISTIANSEN. At Botanical Museum of Copenhagen.

3) Copenhagen, Assistens Cemetery, on *Fraxinus excelsior*. Spores 5.5 μ. 6. Aug. 1954. Leg. et det. M. P. CHRISTIANSEN.

4) Elsinore, Marienlyst Allé, on *Aesculus hippocastanum*. Spores 5.5 μ. 12. July 1953 and 18. July 1955. Leg. D. MÜLLER. At Laboratory of Plant Pathology, Royal Vetr. and Agric. College, Copenhagen.*)

REFERENCES

Cejp, K.: New finds of the rare Myxomycet, Lycogala flavo-fuscum, in this country. (Orig. in Czech.). — Ceská Mykologie 6: 156—159, 1952.

Ehrenberg, G.: Sylvae mycologicae Berolinensis. Dissert. Berlin 1818.

Elliott, W.: Danish Myxomycetes. — Botan. Tidsskr. 39: 357—367, 1927.

Fries, R.: Sveriges Myxomyceter. — Kungl. Vetensk.-Akad. Förhandl., Stockholm 1899: 215—246, 1899.

Raunkiær, C.: Myxomycetes Daniae eller Danmarks Slimsvampe. — Botan. Tidsskr. 17: 20—105, 1888.

Rostafinski, J.: Śluzowce (Mycetozoa). Monografia. Paris 1874—76.

Copenhagen, January 1956.

*) In 1956 the following two finds are recorded: 23. July on *Acer pseudoplatanus* at the Vigeland Museum in Oslo, Norway, the first find in Norway. Leg. et det. M. P. CHRISTIANSEN. 31. July on *Ulmus glabra* at a height of 1,5 m by Kronborg, Elsinore. Leg. D. MÜLLER.

TWO LITTLE-KNOWN DANISH MUSHROOMS:

BOLETUS FRAGRANS VITT. AND BOLETUS EDULIS VAR. CITRINUS PELTEREAU

By F. H. MÖLLER

The occurrences of our less common Danish *Boletus* species in Lolland, Falster and Mön, as well as in the vicinity of Vordingborg (Zealand) are now fairly well established in detail. Nevertheless, the following three species have not yet been found in that area: *Boletus cavipes* OPAT., *B. lignicola* KALLENB., and *B. placidus* BON., all of which are associated with particular trees or substrates and have been observed only once or a couple of times in Denmark. A great number of the other species are rare, or fairly rare, in the abovenamed southern region of Denmark, viz.:

Boletus aeruginascens SECR. (syn. *B. viscidus* FR.); Lolland: 2 localities; Falster: 3 localities.

B. castaneus BULL. ex. FR.; Mön: 2 localities.

B. cramesinus SECR. (syn. *B. gentilis* QUÉL., *B. aurisporus* sensu KALLENB.); Falster: 1 locality, 1 specimen.

B. crocipodius LET. (syn. *B. nigrescens* RICH. & ROZE, *B. rimosus* sensu KALLENB.); Lolland: 2 localities.

B. cyanescens BULL. ex. FR.; Lolland: 1 locality; Falster 2 localities.

B. duriusculus KALCHBR. & SCHULZ.; Lolland: 1 locality.

B. fechtneri VEL. (syn. *B. aestivalis* sensu KALLENB.); Falster: 3 localities.

B. flavidus FR. var. *juranus* QUÉL.; Falster: 1 locality.

B. impolitus Fr.; Lolland: 2 localities; Falster: 1 locality.

B. lividus Bull. ex. Fr.; Lolland: 2 localities; Falster: 1 locality.

B. parasiticus Bull. ex. Fr.; Lolland: 4 localities.

B. pseudoscaber Secr., non Kallenb. (syn. *B. porphyrosporus* Fr.); Falster: 1 locality.

B. pulverulentus Opat.; Lolland: 2 localities; Vintersbølle Forest at Vordingborg: 1 locality.

B. purpureus Fr. (syn. *B. rhodoxanthus* Krombh.); Lolland: 2 localities; Falster: 2 localities.

Phylloporus rhodoxanthus (Schw.) Bres.; Lolland: 2 localities; Vintersbölle Forest: 1 locality.

Besides, two other species or varieties may deserve the designation "rare", viz. *Boletus fragrans* Vitt. and *B. edulis* Bull. ex. Fr. var. *citrinus* Peltereau. These two species are mentioned in greater detail in the following.

1. Boletus fragrans Vitt. 1835.

Syn.: *Boletus aereus* Secr. 1833; *B. xanthoporus* Krombh. 1846.

Habitat: Lolland: Skejten at Fuglsang 6/VII 1920 under *Quercus*. Falster: Hovedskov Forest at Tromnæs 9/IX 1934 under *Fagus* and *Quercus;* Vålse Vesterskov Forest 15/VII 1937 under *Quercus;* Nyköbing Falster at the Vesterskov Pavilion under old, preserved *Quercus* 13/VIII 1952, 17/IX 1953.

Cap: 6—12 cm wide, pulvinate, repand, highly tomentose, umber-brown or umber-olive, becoming purple-brown-spotted where touched or rubbed.

Tubes: lemon-yellow, sinuate-free, in the last stage fairly long; pore orifices sulphur-yellow, small, round.

Stem: 4—6 cm × 4—6 cm, ventricose, attenuated at the base, tomentose, apex not reticulate but more or less roughly warty-to-mentose with yellow granules, everywhere yellow or, below the yellow apex, olive and usually spotted with a purple-brown colour.

Flesh: compact, partially white in the young cap and stem, generally deep lemon-yellow above the tubes and near the cuticle of the

stem, in old specimens yellowish-green and almost always dark purple-coloured at the base of the stem, occasionally also under the cuticle of the cap, sometimes becoming slightly, but distinctly, blue on exposure to the air above the tubes.

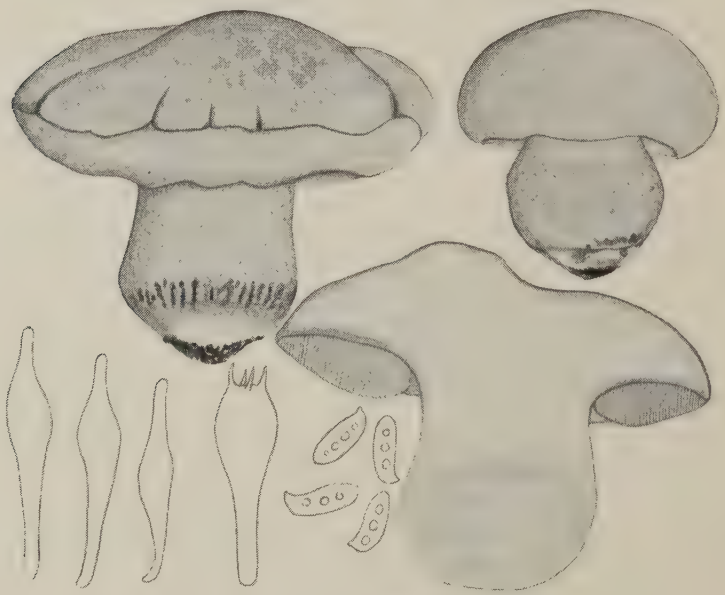
Smell: strong, like that of *Lactarius helvus,* but often with a character of carbolic acid.

Taste: Mild or acidulous.

Reactions: Ferro-sulphate gives greyish-green colour of the flesh and on the cuticle of the stem. Sulpho-vanillin negative.

Spores: 10—12(—13)×4.5—5μ; 10—12(—16)×4—5μ; 10—11×4μ. Mostly 11—12×4.5μ. Basidia 4-spored, often yellow-granular, 30—42×9—11μ. Cystidia from the tubes fusiform, hyaline, 32—42×5—8μ.

This species is perhaps merely a variety of *Boletus impolitus,* but it differs from the latter in the darker colour of the fruit body and the short stem, cystidia and spores (see "Meddelelser fra Foreningen til Svampekundskabens Fremme", Vol. IV, pp. 15—17, 1928).



Boletus fragrans VITT.
Fruit bodies ½×; spores, basidium and cystidia 1000×. — Leg. F. H. MØLLER 1952—53.

It is a familiar fact that *Boletus impolitus* is described with flesh which does not turn blue when cut, but in Falster this species is occasionally found with this flesh reaction, and KÜHNER & ROMAGNESI (Flore anal., p. 38, 1953) distinguish between *B. fragrans* and *B. impolitus* in the following way:

Boletus fragrans. Chair et pores bleuissant legèrement .... Spores 9.5—11 × 3.5—4 μ.

Boletus impolitus. Chair bleuissant très rarement un peu à la coupe au moment de la recolte, en general immuable .... Spores (9)10—14(16) × 4—6 μ.

The very dark coloured figures of *B. impolitus* in MICHAEL Führ. f. Pilzfr. III. No. 282, 1927, are probably *B. fragrans.* BRESADOLA has given a better, though a little too pale picture (Icon. Myc., pl. 926) of *B. fragrans,* which KONRAD & MAUBLANC (Agaricales II, p. 120, 1952), however, call a very dubious, too pale figure. On the other hand, they refer to PELTEREAU's colour plate of *B. fragrans* in BULL. SOC. MYC. FR. 47, Atlas Pl. 45, as "très bonne", but no doubt this one represents rather *B. appendiculatus,* because the stem above is reticulate.

FRIES, who has not seen *B. fragrans* in nature, describes it very well, but he states the colour of the cap to be darker ("fusco-umbrino") than does the author of this paper, and according to FRIES the stem is "laevi", which, however, probably means "not reticulate", for the stem of *B. impolitus* is also described as "laevi".

2. **Boletus edulis** BULL. ex FR. var. **citrinus** PELTEREAU 1931.

Only a brief, incomplete description can be given, because the numerous (about 20) specimens had all expanded and were rather old. These fruit bodies had an appearance quite different from that of the typical *Boletus edulis,* but the reticulate stem and the spore size, together with the qualities of the flesh (mild, not turning blue) agreed only with those of the latter species.

Habitat: Zealand: Vintersbølle Forest, east of Vordingborg, under young beeches, in old leaves, immediately west of the gamekeeper's lodge at Blegen, 28/VIII 1921.

Cap: 8—12 cm wide, pulvinate, in the last stage with acute, rising margin, beautifully lemon-coloured with fulvous parts, especially at the centre of the cap.

T u b e s: Sinuate-free, long, lemon-coloured (the first colour not seen), in the last stage with an olive tinge. The pore orifices pale yellow, later yellowish-green, small and round.

S t e m: 8—11×2—3 cm, more or less fusiform, rather slender, downwards white, upwards Isabel coloured and white-reticulate like that of *Boletus edulis*.

F l e s h: white, later yellow in the cap and sometimes also at the base of the stem; also a reddish tinge is seen in the thick portion of the cap, not turning blue, mild.

S p o r e s: 13—15×3.75—4.5 μ.

Two water-colours executed in 1921 were sent to KALLENBACH, who did not recognize the fungus and wrote on the tables: "Bitte weiter beobachten"! Unfortunately, the variety was not found again, and if KÜHNER & ROMAGNESI (l. c., p. 38) had not given the name of the fungus, the Danish find of it had not been published here. As I have not seen PELTEREAU'S description (in GILBERT: Les Bolets, 1931), I cannot compare it with my notes of 1921. It would therefore be a good thing if the variety could be found again.

Nykøbing Falster, February 9th, 1956.

POLYPORUS HISPIDUS (BULL.) FR. FUNNEN PÅ ÖLAND

Av J. A. NANNFELDT

Under en sommarvistelse på Öland 1953 anträffade jag den 3. aug. på en relativt ung ask i en trädgård vid vägen från Källa ödekyrka till Källa hamn några unga just utväxande fruktkroppar av en stor *Polyporus*-art, som jag misstänkte vara *P. hispidus* (BULL.) FR. (= *Inonotus hispidus* KARST.). Vid återkomsten till Uppsala var Dr. SETH LUNDELL vänlig bekräfta bestämningens riktighet. Svampen sågs ej på något mera träd i omgivningen. Tiden medgav dock ej en grundligare inventering. Ej heller såg jag den någon ytterligare gång under de 10 dagar jag var kvar på Öland och hade arten i tankarna.

Fyndet har sitt givna intresse, i det att arten i Sverige tidigare anträffats blott på Gotland, där den emellertid är ganska utbredd och växer på bl. a. ask, alm och oxel *(Sorbus intermedia)*. Det kan därför måhända förtjäna påpekas, att Källa liksom övriga hamnar på norra Ölands östkust i gångna tider var en viktig överfartsort till och från Gotland.

Det föreligger en litteraturuppgift från Skåne (Häckeberga, på bok, N. F. BUCHWALD; Friesia 1, p. 146, 1933) men denna uppgift avser *P. cuticularis* (BULL.) FR. (= *Inonotus cuticularis* KARST.), som är en typisk bok-svamp och som bland danska mykologer gått under namnet *hispidus,* ända tills detta rättats av BUCHWALD (Naturhist. Tid. 5, p. 64, 1941). Äkta *hispidus* är ännu ej känd från Sveriges fastland.

I Mellaneuropa är arten en allmän och skadlig parasit, bl. a. på äppelträd. Från Danmark synes efter BUCHWALD'S korrigering föreligga blott en uppgift, nämligen om ett fynd från Falster på björk (F. H. MØLLER, Friesia 2, p. 186, 1941). Från Norge föreligger en uppgift, näml. från Oslo på asp, och från Finland likaledes en, näml. från Runsala på ek. Jag har emellertid icke försökt kontrollera om dessa uppgifter från Norge och Finland äro riktiga.

SUMMARY

Polyporus hispidus (Bull.) Fr. found on the Island of Öland (Sweden).

The author reports a find of *Polyporus hispidus* (Bull.) Fr. on a planted ash *(Fraxinus excelsior)* between "Källa ödekyrka" and "Källa hamn". The species was previously known in Sweden only from the Island of Gotland, where it is not rare. It is still unknown from the mainland of Sweden.

Uppsala, February 1956.

ZUR VERBREITUNG DER AGARICALES IN DEN WÄLDERN DES SÜDWESTLICHEN SCHWEDENS

Von T. NATHORST-WINDAHL

In den letzten zwanzig Jahren habe ich in den Landschaften Bohuslän und Västergötland im südwestlichen Schweden zahlreiche Exkursionen gemacht, um besonders die *Agaricales*-Arten zu studieren. Aber auch im nördlichen Halland, in Dalsland und im mittleren Värmland bis an die norwegische Grenze hinauf habe ich an verschiedenen Orten Aufzeichnungen der Pilzflora gemacht und mir unbekannte Arten gesammelt, eingehend beschrieben, photographiert oder gemalt, um sie später zu bestimmen. Das sehr unterschiedliche Auftreten der Pilzarten in den klimatisch stark voneinander abweichenden Beobachtungsjahren machte es notwendig, fortlaufende Untersuchungen im Gebiet zu machen, um ein getreues Bild dieser Flora zu erhalten. Ich habe keine Probeflächen verwendet, sondern mich mit Notierung aller gefundenen Arten und der begleitenden Flora begnügt.

Der Felsengrund dieses Gebietes besteht grösstenteils aus Gneis, welcher teilweise mit Moränensand, Kies und Geröll bedeckt ist. Die Humusschicht ist oft mit Sand und Lehm untermischt. An mehreren Stellen kommt das Urgebirge zum Vorschein. Besonders in Västergötland kommt Sand- und Kalkstein vor, und in gewissen Teilen dieser Landschaft dominiert das bebaute Flachland. Bohuslän ist an der Küste reich an Felsen, Inseln, Schären, tiefen Meerbusen, Mooren und Strandwiesen. Auf diesen Wiesen wachsen sehr oft *Psalliota campestris* und *Lepiota excoriata*. Die Berge dieser Landschaft sind nicht hoch (bis 225 m) und oft teilweise mit *Calluna* bedeckt. In den Landschaften Dalsland und Värmland sind sie dagegen höher (in

Värmland bis 700 m) und die Wälder grösser. Die Seen sind zahlreich, und der Wänersee, der grösste See Schwedens, bedeckt eine Fläche von 5568 qkm. Das Klima des südwestlichen Gebietes ist subatlantisch, die Bodenfläche erhebt sich gegen die norwegische Grenze, und das Klima ist dort mehr kontinental. Die mittlere Temperatur ist in Gotenburg + 7,7° C, in Karlstad am Wänersee + 5,9° C. Die jährliche durchschnittliche Niederschlagsmenge variiert im Gebiet zwischen 625 und 800 mm.

Grosse Wälder von einheitlichen Charakters sind in Bohuslän und Västergötland kaum vorhanden, und deshalb wurde dort die Feststellung der ökologischen Bindung der *Agaricales* an bestimmte Wald-Gesellschaften sehr erschwert. Die Fruchtkörper vieler Pilze treten nur in einzelnen Jahren auf, das Myzel aber kann manchmal jahrelang steril im Boden verbleiben. Im Herbst 1955 erschien *Clitocybe (Hygrophoropsis) aurantiaca* var. *pallida* überall in den Nadelwäldern in der Nähe von Gotenburg. Dieser Pilz ist dort früher sehr selten beobachtet worden. In den Jahren 1941—1943 wurde *Tricholoma colossus* an verschiedenen Orten im Gebiet beobachtet. Seitdem ist sie meines Wissens nur einmal dort wiedergefunden. Für die Erscheinung der Fruchtkörper dürfte wohl die Wärme und Feuchtigkeit des Bodens und die Lage des Grundwasserstands massgebend sein.

Die unterschiedliche Verbreitung vieler *Agaricales* entspricht in mancher Beziehung der Verbreitung bestimmter Waldverbände. Folgende Bäume kommen im Gebiet überall vor: *Pinus silvestris*, *Picea abies*, *Populus tremula*, *Betula pubescens*, *B. verrucosa* und *Sorbus aucuparia*. Die *Larix*-Arten werden zuweilen kultiviert und *Picea abies* kommt an der Küste spontan nicht vor. *Ulmus glabra*, *Malus silvestris*, *Sorbus intermedia*, *S. suecica*, *Tilia cordata* und *Acer platanoides* kommen in Värmland zerstreut vor, sind aber sonst häufig. *Fraxinus excelsior*, *Quercus robur* und *Corylus avellana* haben ihre Nordgrenze im mittleren Värmland. *Fagus silvatica* ist südlich orientiert und in Värmland nicht spontan. *Alnus incana* ist dagegen nördlich orientiert und kommt im Gebiet hauptsächlich in Värmland vor. Es gibt grössere Blätterpilze, die nur in den Wäldern leben, ohne, wie es scheint, mit den Bäumen dort Mykorrhiza zu bilden, z. B. *Stropharia (Geophila) Hornemannii*, *Lepiota rhacodes*, *Clitocybe clavipes*, *Tricholoma (Rhodopaxillus) nudum* und die meisten *Cortinarien*. *Collybia maculata*, die sonst in den Kiefernwäldern wächst, kann zufällig im Laubwald ganz überraschend erscheinen. Es lässt sich ja denken,

dass diese Art nicht Mykorrhizabildner ist. Nach verschiedenen Floren soll *Boletus badius* im Nadelwald wachsen, im südwestlichen Schweden kommt diese Art auch unter Laubbäumen, besonders Eichen, vor. Professor Fabritius Buchwald teilt mir mit, dass sie auch in Dänemark unter Laubbäumen vorkommen kann. In Bohuslän und im nördlichen Halland habe ich niemals *Hygrophorus erubescens* und *Stropharia (Geophila) Hornemannii* gesehen, obwohl sie in den übrigen Landschaften des Gebietes nicht selten sind. Dagegen scheint *Russula sardonia* viel häufiger an der Westküste zu sein als in den übrigen Teilen Schwedens. Einige *Agaricales,* die ich im Gebiet nie beobachtet habe, wachsen im südlichen Schweden, z. B. *Boletus floccopus, Lepiota Bucknallii, L. hystrix, Mycena crocata, Pluteus leoninus, Inocybe jurana, I. Patouillardii* und *Coprinus picaceus.*

Die folgenden Listen sind keineswegs vollständig. Manchmal dauert es eine geraume Zeit, bis z. B. eine *Cortinarius*-Art in ihrer ganzen Variationsbreite erfasst wird, und ganz gewiss erübrigt es, noch weitere Arten im Gebiet zu finden und manche Gegenden, besonders in Dalsland und Värmland, zu untersuchen. In den Listen, die alphabetisch angeordnet sind, habe ich nicht die Möglichkeit die Pilze umgebende Flora zu erläutern. Die Listen würden dann viel zu umfangreich werden. Die Autornamen mussten wegbleiben. Nur im Falle, dass eine Art nicht eindeutig ist, folgt hinter dem Artnamen „ss.", das heisst sensu oder im Sinne von, z. B. ss. Lge. Die Zahl hinter den Namen gibt die Häufigkeit an, wobei 4 die grösste Häufigkeit, 3 ziemlich häufig, 2 ziemlich selten und 1 selten angibt. Der Buchstabe „s." hinter dem Artnamen bedeutet saurer Boden, „S." *Sphagnum* und „m.", dass der Pilz auch im Mischwald wächst; „a." bedeutet *Alnus,* „b." *Betula,* „c." *Corylus,* „f." *Fagus,* „p." *Populus tremula* und „q." *Quercus,* unter welchen Bäumen diese Pilze das Optimum ihrer Verbreitung haben.

Kiefernwälder

Boletus bovinus 4, *edulis* ssp. *pinicola* 3, *flavidus* S. 1, *luteus* 4, *piperatus* 3, *variegatus* 4,
Collybia maculata 2, *tenacella* ss. Favre 2,
Cortinarius mucosus 3, *obtusus* 4,
Gomphidius rutilus (viscidus) 1,
Hygrophorus hypothejus 4,
Lactarius deliciosus 3, *helvus* s. 4, *mammosus* 3, *rufus* 4,
Russula caerulea 3, *sardonia* 4,
Tricholoma colossus 1, *flavovirens (equestre)* 2, *imbricatum* 3, *portentosum* 3.

Nadelwälder

Amanita citrina 3, *fulva* 2, *muscaria* ssp. *regalis* 2, *porphyria* 3, *spissa* 2, *vaginata* 1,
Armillaria (Clitocybe) mellea 3, *A. (Biannularia) imperialis* 1,

Boletus badius 2, *calopus* 2, *felleus* 3, *subtomentosus* 3,

Clitocybe Alexandri 2, *C. (Hygrophoropsis) aurantiaca* 4, *brumalis* ss. LGE 2, *clavipes* 3, *diatreta* 2, *dicolor* ss. LGE 2, *ditopoda* 3, *gilva* m. 3, *inversa* ss. RICK. m. 3, *Langei* m. 2, *metachroa* 2, *odora* 3, *pithyophila* ss. LGE 3, *squamulosa* 1, *C. (Hygrophoropsis) umbonata* s. 2, *vibecina* ss. RICK. 2,

Collybia (Marasmius) acervata ss. FAVRE 2, *C. butyracea* 3, *distorta* 1, *esculenta* ss. FAVRE 3,

Cortinarius armeniacus 2, *brunneus* 1, *callisteus* 4, *camphoratus* 3, *cinnamomeo-lutescens* 3, *cinnamomeus* 4, *collinitus* m. 3, *cumatilis* 1, *erythrinus* ss. LGE 2, *fasciatus* 3, *gentilis* 2, *glaucopus* 2, *malachius* ss. LGE 2, *obtusus* 4, *rapaceus* ss. LGE 1, *sanguineus* 3, *scaurus* ss. RICK. s. 2, *semisanguineus* 4, *traganus* 3, *turmalis* 2, *violaceus* 2,

Cystoderma amianthinum 3, *carcharias* 3,

Flammula (Dryophila) lenta 3, *F. (Gymnopilus) penetrans* 3, *F. (Gymnopilus) picrea* 2, *F. (Dryophila) astragalina* 2, *F. (Dryophila) scamba* 2, *F. (Dryophila) spumosa* 3,

Gomphidius glutinosus 4, *roseus* 1,

Hebeloma mesophaeum 2, *sinuosum* ss. K. & M. 1, *spoliatum* 2, *strophosum* 2,

Hygrophorus agathosmus 3, *camarophyllus* 2, *erubescens* 3, *pustulatus* 4, *olivaceoalbus* ss. K. & R. 3, *tephroleucus* 2,

Hypholoma (Geophila) capnoides 4, *H. (Geophila) dispersum* ss. K. & M. 2, *H. (Geophila) radicosum* ss. LGE 1,

Inocybe calamistrata 2, *dulcamara* ss. HEIM 1, *lacera* 4, *sambucina* 1,

Laccaria laccata 3,

Lactarius camphoratus 3, *deliciosus* 2, *flexuosus* 4, *fuliginosus* 2, *helvus* b. s. 4, *hepaticus* 1, *hysginus* 1, *lignyotus* 2, *mitissimus* 2, *repraesentaneus* s. 2, *rufus* 4, *scrobiculatus* 2, *trivialis* 3, *volemus* 1,

Lentinus (Lentinellus) bisus 1,

Lepiota rhacodes 3,

Marasmius androsaceus 3, *M. (Xeromphalina) fulvobulbillosus* 2, *impudicus* 1, *perforans* 4, *putillus* 1,

Mycena alcalina 3, *amicta* 2, *cyanorrhiza* 1, *elegans* ss. SMITH 1, *epipterygia* 4, *flavoalba* 2, *galopoda* 3, *lactea* 2, *metata* ss. ROMELL, LUNDELL, RICK., LGE, SMITH, 3, *rosella* 3, *rubromarginata* ss. SMITH 2, *sanguinolenta* 4, *vulgaris* 3, *zephirus* 3,

Naucoria (Galerina) sideroides 1,

Omphalia bisphaerigera 1, *cyathiformis* 3, *chrysophylla* 2, *O. (Xeromphalina) campanella* 3,

Paxillus atrotomentosus 3, *involutus* 4, *panuoides* 2,

Pholiota (Rozites) caperata 3, *P. flammans* 3, *P. (Galerina) marginata* 3,

Pleurotus (Panellus) mitis 4, *P. (Pleurotellus) porrigens* 3,

Pluteus atromarginatus 1,

Psalliota silvatica 2,

Rhodophyllus hirtipes ss. K. & M. 1, *madidus* 2, *nitidus* 2, *vernus*, non *Ent. pascuum* ss. BRES. 1,

Russula aurata 1, *azurea* 2, *consobrina* 1, *decolorans* 4, *emetica* 3, *integra* 3, *Mariae* ss. J. SCHÄFF. 1, *obscura (vinosa)* 3, *ochroleuca* 4, *paludosa (elatior)* s. 3, *puellaris* 2, *Queletii* 2, *sanguinea* 2,

Stropharia (Psathyrella) Caput-Medusae 1, S. *(Geophila) Hornemannii (depilata)* 2,

Tricholoma aestuans 2, *albobrunneum* 3, *T. (Melanoleuca) cognatum* 1, *T. decorum* 3, *T. inamoenum* 2, *T. (Leucopaxillus) lentum* 1, *T. (Rhodopaxillus) nudum* 3, *T. rutilans* 3, *saponaceum* 3, *sejunctum* 2, *sudum* 1, *vaccinum* 3.

Lärchenbäume

Boletus cavipes 1, *Grevillei* 3, *viscidus* 1,

Lactarius porninsis 1,

Tricholoma psammopus 2.

Laub- und Mischwälder

Amanita citrina m. 4, *excelsa* 1, *fulva* m. 4, *inaurata (strangulata)* m. 2, *muscaria* m. 4, *pantherina* m. 2, *phalloides* m. 1, *rubescens* m. 4, *vaginata* m. 2, *virosa* f. 2,

Armillaria (Clitocybe) mellea m. 3, *A. (Collybia) mucida* f. 2,

Asterophora lycoperdoides m. 3, *parasitica* 1,

Boletus appendiculatus 1, *aurantiacus* p. 3, *badius* m. 2, *calopus* f. m. 2, *carpini* c. p. 1, *chrysenteron* 4, *cyanescens* 2, *edulis* 4, *erythropus* q. 3, *lividus* a. 1, *luridus* 1, *parasiticus* 2, *reticulatus* q. 2, *rubellus (versicolor)* s. a. q. 2, *scaber* b. 3, *subtomentosus* m. 3, *B. (Leccinum) testaceo-scaber* b. 3,

Claudopus (Phyllotopsis) nidulans 1,

Clitocybe candicans ss. RICK. 2, *C. cerussata* 1, *connata* 2, *fragrans* 3, *C. (Leucopaxillus) gigantea* 2, *C. infundibuliformis* m. 3, *nebularis* m. 3, *odora* m. 3, *phyllophila* ss. LGE 2,

Clitopilus cretatus 1, *hirneolus* m. 2, *prunulus* m. 3,

Collybia butyracea m. 3, *butyr.* var. *asema* 4, *cirrhata* 2, *cirrh.* var. *Cookei* 2, *dryophila* 4, *palustris (leucomyosotis)* S. 3, *platyphylla* 3, *plexipes* 1, *racemosa 1, radicata* f. 3, *C. (Lyophyllum) rancida* m. 2, *C. tuberosa* m. 3, *velutipes* 3,

Coprinus atramentarius 3, *disseminatus* 3, *dilectus* 1, *extinctorius* ss. RICK. 1, *impatiens* 3, *lagopus* 2, *micaceus* 3, *niveus* 2, *plicatilis* 2, *silvaticus (tardus* KARST. ss. LGE) 2,

Cortinarius acutus m. 2, *alboviolaceus* m. 2, *anomalus* b. m. 3, *armillatus* b. m. 4, *balteatus* ss. K. & M. 2, *bibulus* s. a. 1, *bolaris* q. 3, *cinnamomeus* m. 4, *cinnamomeo-lutescens* m. 3, *concinnus* s. 1, *croceocaeruleus* ss. LGE 1, *cyanopus* m. 2, *delibutus* m. 2, *elatior* 3, *emollitus* f. 2, *evernius* m. s. 3, *flexipes* m. 3, *hemitrichus* m. 3, *hinnuleus* q. 2, *helvelloides* a. 2, *holophaeus* f. 1, *infractus* m. 3, *lucorum* 1, *multiformis* ss. K. & M. m. 2, *nemorensis* ss. LGE f. 1, *paleaceus* m. s. 3, *phoenicceus* ss. K. & M. 2, *pholideus* m. 4, *psammocephalus* ss. LGE 1, *rigidus* ss. LGE *(rigidus* forma) 3, *rubicundulus* 1, *sciophyllus* 2, *scutulatus* ss. K. & M. s. 2, *subpurpurascens* ss. RICK. 2, *torvus* f. 3, *triumphans* b. 2,

Crepidotus Cesati m. 3, *fragilis (autochtonus* ss. LGE) 2, *haustellaris* 2, *Lundellii* 3, *mollis* 2, *variabilis* 3,

Cystoderma granulosum m. 2,

Flammula (Dryophila) alnicola 4, *F. gummosa* m. 2,

Hebeloma longicaudum 2, *sacchariolens* 3,

Hygrophorus chrysodon 1, *citrinus* ss. LGE 1, *cossus* 2, *eburneus* f. 2, *leucophaeus* f. 1, *subradiatus* 1, *turundus* s. 2, *unguinosus* 2,

Hypholoma (Drosophila) appendiculatum (hydrophilum auct. plur.) 3, *H. (Drosophila) Candolleanum* 3, *H. (Geophila) fasciculare* 4, *H. (Geophila) sublateritium* 3,

Inocybe asterospora q. 2, *calospora* s. 2, *cincinnata* 2, *Cookei* ss. LGE 2, *decipientoides* 3, *descissa* 1, *eutheles* 2, *fastigiata* 4, *geophylla* 4, *grammata* ss. LGE 2, *hystrix* f. 1, *lacera* 4, *lanuginosa* q. c. 2, *maculata* 2, *microspora* 1, *napipes* q. 3, *paludinella (trechispora* ss. LGE) s. 1, *perlata* 1, *petiginosa* f. 2, *pusio* ss. LGE 1, *umbrina* q. 2, *xanthomelaena* 1,

Laccaria laccata 4, *tortilis* 2,

Lactarius aspideus 2 *(Salix), blennius* f. 4, *camphoratus* m. 3, *chrysorrheus* q. 2, *fuliginosus* m. 3, *glyciosmus* 3, *insulsus* ss. NEUH. q. 1, *lilacinus* a. 1, *obscuratus* a. 4, *pallidus* f. 2, *piperatus* 2, *pyrogalus* c. 3, *quietus* q. 4, *serifluus (cimicarius)* 3, *spinosulus* b. 2, *subdulcis* f. 3, *thejogalus* 3, *torminosus* b. 4, *turpis* s. b. m. 4, *uvidus* s. m. 2, *vellereus* 2, *vietus* s. 3, *violascens* 1, *volemus* f. m. 2,

Lentinus (Lentinellus) cochleatus 2, *suavissimus* 3,

Lepiota acutesquamosa 2, *cristata* 3,

Marasmius alliaceus f. 2, *confluens* 3, *epiphyllus* 3, *foetidus* c. 1, *fuscopurpureus* ss. LGE f. 3, *languidus (candidus* LGE) 3, *peronatus* 3, *prasiosmus* 1, *ramealis* 4, *recubans* f. 1, *rotula* 4, *scorodonius* 3, *splachnoides* 2,

Mycena acicula 2, *adonis* 1, *alcalina* 3, *capillaris* f. 3, *citrinomarginata* m. 1, *corticola* 3, *fagetorum* f. 2, *fibula (Omphalia)* 4, *M. filopes* ss. K. & M. 2, *flavescens* m. 2, *galericulata* 4, *galopoda* 4, *haematopoda* 3, *inclinata* q. 3, *leptocephala* ss. RICK. m. 3, *niveipes* 2, *polygramma* 3, *pterigena* 3, *pura* 3, *rorida* 2, *sanguinolenta* 4, *M. (Omphalia) speirea* 2, *M. stylobates* 2, *vitilis* ss. LGE 2,

Naucoria (Alnicola) alnetorum a. 2, *N. (Agrocybe) arvalis* 2, *N. bohemica* 2, *carpophila* f. 3, *N. (Phaeocollybia) Christinae* 1, *N. (Geophila) crobula* 1, *N. (Macrocystidia) cucumis* m. 2, *N. erinacea* 3, *escharoides* ss. LGE a. 4, *granulosa* 1, *reducta* a. 1, *scolecina* FR. a. 2, *submelinoides* a. 2, *N. (Gymnopilus) subsphaerospora* 1, *N. triscopoda* 2,

Omphalia (Delicatula) integrella s. 3, *O. oniscus* ss. FAVRE S. 1, *picta* 2,

Panus conchatus b. 3, *ringens* b. 1, *stipticus* q. 4,

Paxillus involutus m. 4,

Pholiota (Dryophila) aurivella 2, *P. (Rozites) caperata* m. 3, *P. destruens* 2, *P. (Agrocybe) erebia* 2, *P. (Conocybe) filaris* 1, *P. (Dryophila) flammans* m. 1, *P. (Naucoria) muricata* f. 1, *P. (Dryophila) mutabilis* 4, *P. (Agrocybe) praecox* 3, *P. (Hebeloma) radicosa* f. 1, *P. (Gymnopilus) spectabilis* q. 3, *P. (Dryophila) squarrosa* 3,

Pleurotus (Geopetalum) applicatus 2, *P. (Geopetalum) atrocaeruleus* 3, *P. dryinus (corticatus)* 1, *P. lignatilis* 1, *P. (Geopetalum) rhacodium* 1, *P. (Panellus) serotinus* 3, *P. (Lyophyllum) ulmarius* 2,

Pluteolus (Bolbitius) aleuriatus 2,

Pluteus cervinus 3, *chrysophaeus* 1, *Godeyi* 1, *lutescens* 2, *nanus* 3, *pellitus* f. 1, *phlebophorus* 2, *plautus* 1, *salicinus* 2,

Psalliota arvensis 3, *augusta* 2, *Langei* 1, *macrospora* 2, *silvatica* m. 2, *silvicola* 1, *vaporaria* ss. MÖLL. 1,

Psathyrella (Drosophila) fibrillosa ss. RICK. 2, *gracilis* 3, *microrhiza* ss. RICK. 1, *multipedata* 2, *noli tangere* a. 1, *obtusata* ss. LGE 2, *papyracea* ss. LGE 1, *spadicea* ss. RICK. 2, *sphagnicola* S. 1,

Rhodophyllus aprilis 1, *byssisedus* 2, *carneoalbus* s. 1, *cetratus* 2, *clypeatus* 3, *dysthales* 1, *euchrous* 2, *icterinus* 3, *minutus* 2, *nidorosus* S. 3, *porphyrophaeus* 1, *rhodocylix* s. 1, *rhodopolius* 2, *staurosporus* 4, *undatus* 1, *versatilis* 1,

Russula adusta m. 3, *aeruginea* b. 4, *albonigra* m. 1, *alutacea* m. 2, *claroflava* s., b. 3, *cyanoxantha* 3, *delica* 3, *emetica* f. *fagicola* 3, *exalbicans* b. 2, *farinipes* 1, *fellea* f. 3, *foetens* 3, *fragilis* s. 3, *grisea* f. 1, *heterophylla* 1, *integra* m. 3, *lauroceraci* 2, *lepida* f. 2, *lilacea* 3, *Lundellii* b. 1, *lutea* 2, *nigricans* 4, *nitida* s. 3, *ochroleuca* 4, *pectinata* 2, *pseudointegra* q. 1, *solaris* f. 1, *sororia* q. 2, *Velenovskyi* b. 2, *versicolor* b. 2, *vesca* 3, *virescens* 1, *xerampelina* m. 3,

Schizophyllum commune 2,

Stropharia (Geophila) squamosa 2,

Tricholoma album 2, *T. (Melanoleuca) cognatum* 1, *T. columbetta* 1, *flavobrunneum* b. 3, *T. (Melanoleuca) grammopodium* 1, *T. (Rhodopaxillus) irinum* 1, *T. (Rhodopaxillus) nudum* 3, *T. (Rhodopaxillus) personatum* 1, *T. scalpturatum* 2, *sulphureum* 2, *terreum* 2, *ustale* f. 2, *virgatum* f. 3,

Tubaria (Naucoria) autochthona 1, *conspersa* ss. K. & R. 3, *furfuracea* ss. ROMAGN. 1, *pellucida* ss. RICK. 2.

Gotenburg, Februar 1956.

YELLOW PHYLLODE SPOT AND DROP OF ACACIA ARMATA R. Br. (SEPTORIA ACACIAE sp. nov.)

By PAUL NEERGAARD

Phytopathological Service of Denmark

In October 1954 a serious phyllode spot and drop was encountered in a consignment of *Acacia armata* R. Br. (*A. paradoxa* DC.), subjected to inspection for export at the Phytopathological Service of Denmark. The disease seems not previously to have been reported in literature. The following description of the disease and its probable causal agent is based upon examination of plants kindly placed at my disposal by the exporter.

ECONOMIC SIGNIFICANCE

In Denmark the host, *Acacia armata* has been cultured for some years in a few nurseries as a pot culture under glass. During 1954 and 1955 a considerable number of plants in the nursery of the exporter was so severely attacked, that they had to be discarded, and the rest part of the culture, comprising several thousand plants, were affected to such a degree that their commercial value was reduced by about 50 per cent. The losses due to the disease during these years in the said nursery are estimated at several thousand kr. Essentially on account of the disease it has been decided to abandon the culture.

SYMPTOMS

Small chlorotic spots appear, scattered irregularly on the phyllode. At first they are almost circular, later more irregular, sometimes finally necrotic at the center. The spots are frequently less than 1 mm in diameter, but the chlorotic areas commonly coalesce to affect almost the entire phyllode (Fig. 1).

Fig. 1. Phyllodes of *Acacia armata* with yellow spot (about 3×).

Fig. 2. Plants of *Acacia armata*, attacked by the yellow phyllode spot and drop. The two plants at left severely, the two plants at right slightly affected.

In these yellow areas the tissues are clearly more solid and dry than the normal green phyllode tissue, and furthermore the diseased tissues are somewhat thickened. The lowest phyllodes are first attacked, the attack of the shoots moving upwards, and even the youngest phyllodes of the shoots are sometimes affected. Finally the phyllodes fall off in the succession of the development of symptoms (Fig. 2).

ETIOLOGY

On examining microscopically the affected tissues of phyllodes that still have not been shed, dense textures, here and there almost mats, of extremely fine mycelium were found (Fig. 3), whereas no sporulation. On the other side, in dead phyllodes previously dropped from the plant a great number of pycnidia were found with numerous hyaloscolecosporous conidia. I have determined this fungus to *Septoria.*

The fungus was repeatedly and readily isolated, partly from phyllodes, taken directly from the plant, partly from pycnidia in dead, dropped phyllodes that have remained for some time on the pot soil.

On malt extract agar the fungus developed in about five days abundantly sporulating stromatic-pycnidial structures, suggesting a morphologic relationship to *Cytosporina* (Figs. 6 and 7).

Furthermore, in some of the dead phyllodes, pycnidia of what is believed to be *Leptothyrium* sp. (Fig. 10) were found, but no conidia were encountered in this connection.

Various stages in the development of the *Septoria* pycnidia were observed. It is remarkable that the pycnidial primordia are formed predominantly around the stomata — with the stoma placed above the center of each pycnidium (Figs. 4 and 10).

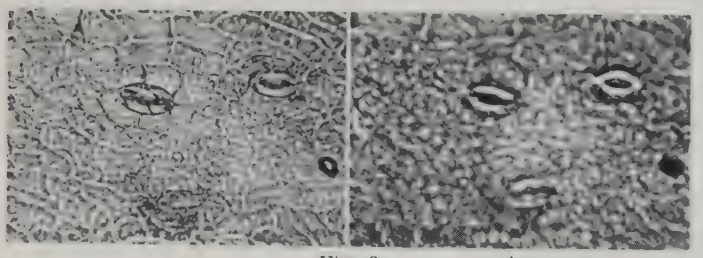
As no other *Septoria* or *Phleospora* form on *Acacia* corresponding to the features of the fungus under consideration seems to have been described, it is proposed as a new species.

Septoria acaciae sp. nov.

Description. Pycnidia (Figs. 4 and 5) numerous, amphigenous, scattered or subgregarious, subglobose to lens-shaped, at maturity with a wide opening, before rupture being covered by the epidermis of the host and frequently placed under a stoma (Fig. 4), immersed, glabrous, dark brown, 60—110 μ in diam., pycnidial wall pseudoparenchymatous, with a depth of 5—10 thick-walled cells.

Conidiophores have not been observed.

Figs. 3—8. *Septoria acaciae* sp. nov.



a Fig. 3 b

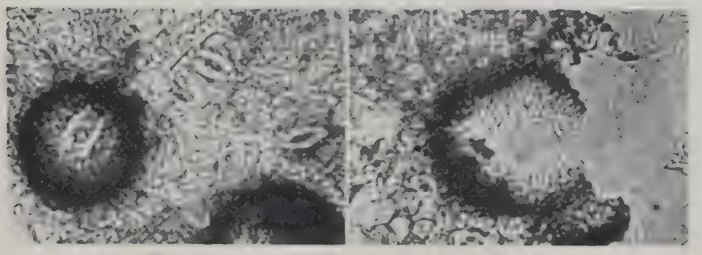


Fig. 4 Fig. 5

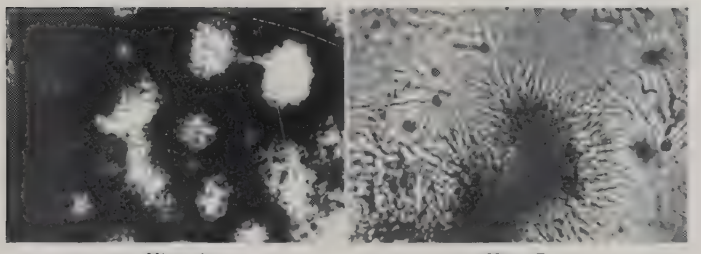


Fig. 6 Fig. 7

a Fig. 8 b

Fig. 3. a. Epidermis of a phyllode; b. Texture of hyphae developed below the epidermis shown in a. — Fig. 4. Pycnidium formed around and below a stoma. — Fig. 5. Transverse section of a pycnidium. — Fig. 6. Sporulating pycnidial structures on malt extract agar. — Fig. 7. Sporulating tissues on malt extract agar. — Fig. 8. Conidia; a) from a phyllode of *Acacia armata;* b) from culture on malt extract agar. — Figs. 3—5 and 7—8 about ×250; Fig. 6 about ×100.

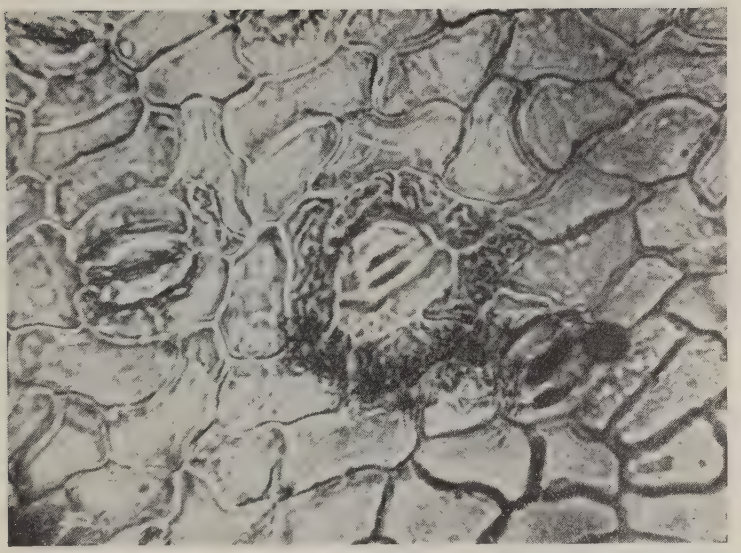


Fig. 9. Primordium of a pycnidium of *Septoria acaciae*, developed around a stoma.

Conidia (Fig. 8) filiform to subcylindrical, rounded at both ends, straight, seldom slightly curved, frequently with one indistinct medial septum, hyaline, 8—36 × 1—2.5 μ (see table 1), issuing in white to rosy masses.

On phyllodes of *Acacia armata* R. Br. *(A. paradoxa* DC.), October 1954, Sept. 1955, January 1956, in North Zealand, Denmark.

Culture on malt extract agar. Aerial mycelium dense, velvety, white to slightly grey, submerged mycelium dark olive green to almost black, producing pycnidial structures and sporulating profusely. Diameter of 5 days old culture at room temperature: 8—9 mm.

TABLE 1

Spore measurements in μ for *Septoria acaciae* sp. nov. from *Acacia armata*.

Medium	Length	Width	Average length (25 conidia)
Leaf	10—22	1—1.5	17.9
Malt extract agar	8—36.5	1.5—2.5	19.2

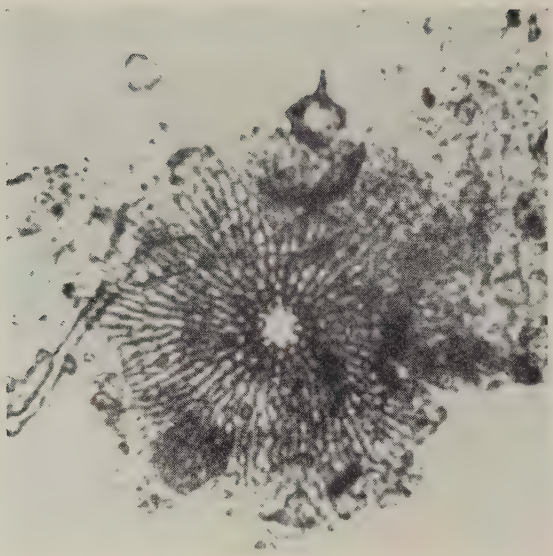


Fig. 10. Pycnidium of *Leptothyrium* sp. on *Acacia armata*.

DIAGNOSE LATINE

Septoria acacia sp. nov.

Maculis amphigenis, subrotundatis irregularibusque, confluentibus, chlorinis.

Pycnidiis amphigenis, immersis, dispersis vel subgregariis, subglobosis vel lenticularibus, glabris, atro-brunneis, 60—110 μ diam., contextu pseudoparenchymatico.

Conidiophoris vix ullis.

Conidiis filiformibus vel subcylindraceis, rectis vel leviter curvulis, utrinque rotundatis, continuis vel indistincte-1-septatis, hyalinis, 8—36 $\times$ 1—2,5 μ.

Hab. in phyllodiis vivis vel emortuis-dejectis *Acaciae armatae* R. Br., Oct. 1954, Sept. 1955, Jan. 1956. Selandia, Daniae.

Typus in Kgl. Veterinær- & Landbohøjskole, Plantepatologisk Laboratorium, Hafnia, Dania, cultura ex typo in Centraalbureau voor Schimmelcultures, Baarn, Hollandia, depos.

CYCLE OF THE DISEASE AND CONTROL

The fungus seems not to develop pycnidia in the affected, but still living tissues of the phyllodes on the plant. In the dead tissues of fallen phyllodes, however, the pycnidia are formed profusely, and from these the conidia have ample opportunities of reaching and

infecting healthy phyllodes. Consequently, in order to control the disease, it is imperative to remove all phyllodes as soon as they have been dropped, and still better, to remove cautiously all infected plants. Furthermore, it is suggested repeatedly to spray the plants with fungicides. This has been practised in the said nursery by spraying with ¼% Captan, but the treatment caused a heavy phyllode drop and no further experiments were carried out. The whole lot of plants, however, were here entirely affected by the fungus so that no or little protection from the spraying could be obtained anymore. Only in the case of healthy plants, protection with fungicides can be expected to work efficiently.

SUMMARY

A serious phyllode spot and drop on *Acacia armata* R. Br. was detected in October 1954. The disease caused a loss of several thousand kr. in one Danish nursery. *Septoria acaciae* sp. nov. was isolated, partly from the diseased tissues of phyllodes taken from the plants, partly from pycnidia developed in dead, fallen phyllodes. Description and Latin diagnosis are given and measures for control suggested.

Copenhagen, February 1956.

SOIL ACTINOMYCETES ANTAGONISTIC TO POLYPORUS ANNOSUS Fr.

By T. VINCENTS NISSEN

Department of Plant Pathology, The Royal Veterinary and Agricultural College, Copenhagen.
Department of Technical Biochemistry, The Technical University, Copenhagen.

INTRODUCTION

Investigations of the possibility of controlling plant diseases by means of antagonistic microorganisms have become topical in the past decade in consequence of the rapid development that has taken place in the antibiotic field of activity. In more recent years the soil-borne *actinomycetes* have been the subject of particular attention, since it is this group of microorganisms which has supplied the largest number of useful antibiotics, after the discovery of penicillin.

The root-rot of Norwegian spruce *(Picea abies)* and other conifers is a serious disease causing heavy financial losses in Scandinavian forests. The mode of infection of the fungus *(Polyporus annosus* Fr.) has not been established with certainty, but the general opinion is that the mycelium of the fungus is capable of growing in the soil, where it attacks the dead tap root of spruce, eventually entering the stem and the living roots.

However, in the laboratory it has so far not been possible to make the fungus grow in unsterilized soil, whereas the mycelium is able to grow in autoclaved soil. Experiments have therefore been made to find out whether any relationship could be traced between antagonistic microorganisms in the uninfested soil and the occurrence of the fungus. Björkman (1949) isolated a large number of soil fungi and tested them for their antagonistic effect on the growth of the mycelium of *Polyporus annosus,* and he found an apparent correlation between the occurrence of the mycelium and soil fungi without inhibitory effects. Rennerfelt (1949, 1952—53) in a similar

experiment found that more than one-third of the isolates (moulds and bacteria) had inhibitory effects on the *annosus* mycelium *in vitro,* one of them being *Trichoderma viride,* which was inhibitory at 22° C, but was itself overgrown by *P. annosus* at 12° C.

On the other hand, as far as the author knows, no investigations have been made of the antagonistic effect of soil-borne actinomycetes on *Polyporus annosus.* In view of the great importance of these microorganisms as producers of antibiotics it was therefore natural to go into this question in greater detail, and in the following a brief account is given of some preliminary investigations made by the author on actinomycetes isolated from woodland soil.

EXPERIMENTAL METHODS AND RESULTS

1. Isolation of actinomycetes from woodland soil.

In the period May—October 1954 a number of soil samples were taken from two regions in Jægersborg Hegn Forest, Zealand.

a. Older stands of Norwegian spruce *(Picea abies)* (forestal sample plot, former name of the region: Husarsletten). The soil samples were taken under sterile conditions at a depth of 5 -20 cm underneath the undecomposed layer of needles. pH of the samples (measured electrometrically): 4.6--4.8. In the region were found numerous fruit bodies of *Polyporus annosus* Fr., which according to the Danish Forest Experiment Station caused considerable damage.

b. Deciduous forest, consisting preponderantly of beech *(Fagus silvatica),* immediately west of the abovenamed Norwegian spruce stand. The soil samples were taken under sterile conditions at a depth of 5—20 cm underneath the undecomposed layer of leaves. pH of the samples (measured electrometrically): 5.9—6.2. Attacks by *Polyporus annosus* could not be demonstrated.

Spreading on glucose-casein-agar (pH 6.8) was done according to the conventional microbiological technique immediately after the samples were taken. All the colonies produced were investigated, but only actinomycetes were isolated. Many of these isolates proved to be replicates of the same species. Altogether, 18 different species were found, out of which 15 had to be referred to *Streptomyces,* 2 to *Micromonospora* and 1 to *Nocardia.*

2. Interaction experiments in agar media.

The isolated actinomycetes were then tested for antagonistic effect *in vitro* on the mycelium of *Polyporus annosus* Fr. Petri

dishes with 2% potato-glucose-agar (pH 6.9) were first inoculated with *Polyporus annosus* in one side, after which they were left to stand for 3 to 5 days at 25° C, because the fungus grows rather slowly. Only when the growth of the fungus was in good progress were the dishes inoculated with the actinomycete — at a fair distance from *Polyporus annosus*.

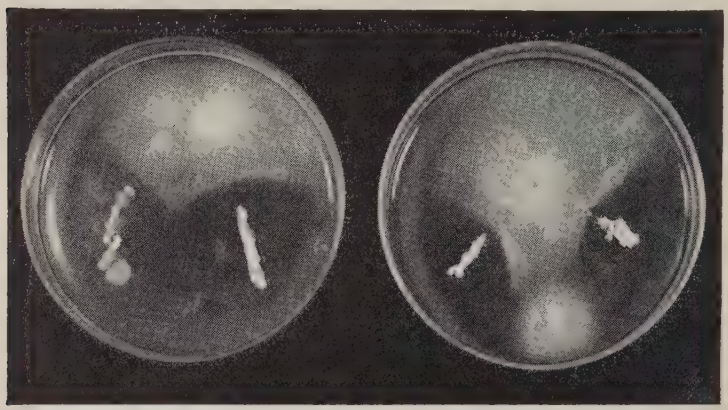


Fig. 1. Interaction between *Polyporus annosus* Fr. and *Streptomyces* sp.; some colonies (clear) of *Nocardia* sp. are seen in the left-hand side of the left-hand Petri dish. The antagonistic activity of the actinomycetes takes place in a distinct zone around the antagonist, into which the hyphae of the fungus do not penetrate.

Of the 18 isolated actinomycetes, altogether 8 species, including *Nocardia* sp., displayed a pronounced antagonistic activity, distinct inhibitory zones being produced after 3 to 7 days (Fig. 1). Five of the antagonists originated from deciduous forest soil, the other three from coniferous forest soil.

3. Interaction experiments in sterilized soil.

On one of the abovenamed antagonistic actinomycetes which had shown the strongest activity *(Streptomyces* sp.) a number of experiments were made in 1954—55 in order to investigate whether the inhibitory activity ascertained in agar media *(in vitro)* could also be demonstrated in soil experiments.

In the tests, larger glass dishes with close-fitting lids were used. To each dish 75 g air-dried garden soil (pH 7.3) and 20% water were added, after which the dishes were autoclaved at 120° C for 3 hours. They were then inoculated with suspensions of spores of the above-

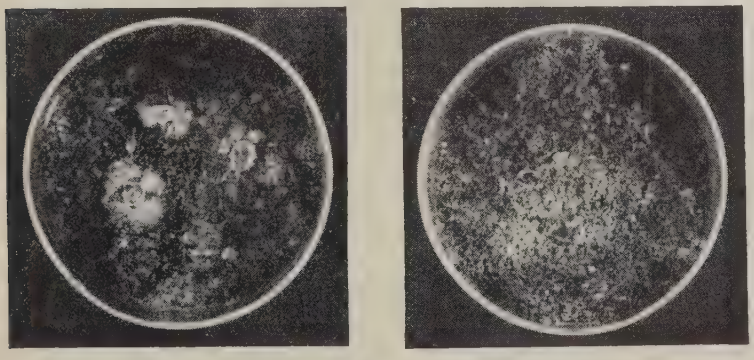
mentioned *Streptomyces* in sterile water. Some dishes, the soil of which was not inoculated with *Streptomyces* spores, were used as controls.

The following tests on *Polyporus annosus* were then made on two — slightly different — methods.

1. After 7 days, a slide covered on one side with nutrient agar and overgrown with mycelium of *Polyporus annosus* was placed on the soil surface under sterile conditions, with the covered side down, in direct contact with the soil.

The slide cultures were produced in the following way: A sterile slide was placed on the bottom of a Petri dish and then covered with a thin layer of nutrient agar; next, the dish was inoculated with *Polyporus annosus*. When the agar was overgrown with the mycelium the slide was cautiously cut out of the culture and placed in a dish with soil, as described above. Also in each of the control dishes, which were not inoculated with *Streptomyces,* a slide with a culture of *Polyporus annosus* was placed. All the tests were made at 25° C.

After 7 days, the results of the tests were made up. *Polyporus annosus* in the control dishes then appeared to have spread from the edges of the slides over the soil surface as a fine cobweb-like mycelium, while in the dishes which had been inoculated with *Streptomyces no* growth of the mycelium from the slides on to the soil could be



a *b*

Fig. 2. Interaction experiments in soil between *Polyporus annosus* Fr. and *Streptomyces* sp. *a.* Growth of *Polyporus annosus* from 3 inocula (agar discs) in sterile soil. *b.* Antagonistic activity. No growth of *Polyporus annosus* in soil previously inoculated with a spore suspension of *Streptomyces* sp. Around the three agar discs the growth of *Streptomyces* sp. is seen as tiny white dots.

ascertained. The growth of the actinomycetes could be demonstrated as numerous, tiny white dots all over the soil surface.

2. Instead of slide cultures, agar discs overgrown with *Polyporus annosus* were used as inocula. The discs were 10 mm in diameter and had been cut from young cultures in Petri dishes. Otherwise, the experiment was performed in a manner similar to that described under 1.

Also in this test series, a distinct inhibition of the mycelium of *Polyporus annosus* could be demonstrated in the dishes which had been inoculated with spores of *Streptomyces* sp. 7 days before, while there was no inhibition at all in the control dishes (Fig. 2 *a* & *b*).

DISCUSSION

Great importance is attached to the question whether the antagonistic microorganisms of which it is known that they form strong antifungal antibiotics in synthetic media, are also capable of producing such substances in unsterilized soil. WRIGHT (1954) has investigated this question with a view to *Trichoderma viride,* which produces *in vitro* two antifungal substances, *gliotoxin* and *viridin*. She found that *gliotoxin* was also produced in acid heath soil, when this soil was amended with accessible carbon compounds (e. g. 1% dried clover), but not in garden soil, unless its pH was changed at the same time towards higher acidity by the addition of acid. Furthermore, she was of the opinion that the increase in the production of antibiotics which was demonstrable after autoclaving of the green-manured soil must be ascribed to the autoclaving having increased the quantity of accessible N and C, rather than having removed competitive microorganisms.

The possibility of controlling soil-borne plant diseases by inoculation of the soil with suitable antagonistic microorganisms has been discussed, for instance, by NISSEN (1953) and BRIAN (1954), and they both point out that present experience tends to indicate that control by this means would give positive results only when large quantities of a suitable medium (green manure) are added together with the antagonist, seeing that it is very difficult for a foreign microorganism to gain a foothold in the well-balanced environment constituted by the soil microflora. On the other hand, there is much to indicate that it will be possible by suitable green-manuring alone to stimulate the antagonistic fraction of the natural micropopulation

or to give the latter a favourable trend so that infestations originating from soil-borne microorganisms are thereby controlled or entirely prevented.

It would be natural to correlate WRIGHT's demonstration of antibiotic-production in natural soil (1954) with the studies on fungistasis carried out by DOBBS & HINSON (1953) and JEFFERYS & HEMMING (1953). According to these investigations, fungistasis having the effect that fungal spores do not germinate, has a universal occurrence in soil. The fact that it is very difficult to demonstrate antibiotics in the soil is, in the first place, presumably due to the considerable adsorption power of the soil, but may also be ascribed to instability of the substances and to their microbial decomposition (JEFFERYS 1952, NISSEN 1954).

On the part played by the actinomycetes as soil-borne antagonists to plant diseases a few positive accounts are available. As early as in 1927 MILLARD & TAYLOR demonstrated that potato scab (caused by *Streptomyces scabies)* could be effectively controlled by the application of green manure, and they assumed that this effect of green manure was due to microorganisms. LOCHHEAD & LANDERKIN have rather recently (1949) established the rightness of this assumption, having managed to isolate from the potato rhizosphere in green-manured soil actinomycetes which were antagonistic to the potato scab parasite. Promising are also the results of MEREDITH's experiments (1946) with the control of a banana disease *(Fusarium oxysporum cubense)* by inoculation of the soil with actinomycetes. Quite recently (1955) it has been demonstrated at Rothamsted Experimental Station that the activity of the actinomycetes on *Helminthosporium sativum,* which is the cause of foot-rot of barley and wheat, is antibiotic and not merely competitive.

In view of the wide-spread occurrence of antagonistic actinomycetes (LANDERKIN et al. 1950, ROUATT et al. 1951) and the ever increasing number of antibiotics which it has been possible to isolate from actinomycetes, it is certainly justifiable to suppose that these microorganisms are able to make their antagonistic activities felt in a high degree in nature. As, moreover, the actinomycetes belong to the zymogenic fraction of the soil micro-flora, i. e. the fraction which, in particular, enters into function when organic matter is added to the soil, there seem to be rather good chances of shifting, by means of green manuring, the microbial balance in a direction adverse to soil-borne pathogens.

CONCLUSIONS

Previous investigations, made particularly by Swedish workers, have proved that certain mould fungi, especially *Penicillium* species, exert an antibiotic activity on *Polyporus annosus* Fr. By the experiments made here it has been demonstrated — and, as far as the author knows, for the first time — that also actinomycetes, not only *in vitro* but also in sterilized soil, may have a strong antibiotic effect on the mycelium of *Polyporus annosus.* Indeed, such antagonistic actinomycetes seem to be rather common in woodland soils. These results are bound to encourage a closer investigation to find out whether it will be possible, by the addition of suitable green manures, to stimulate the natural actinomycete flora in forests infested with *Polyporus annosus,* thereby possibly inhibiting the spread of this highly injurious pathogenic fungus.

SUMMARY

Of 18 actinomycetes species isolated from Danish woodland soil, 8 proved to be antagonistic to *Polyporus annosus* Fr. *in vitro.* One species *(Streptomyces sp.)* showed a pronounced inhibitory effect on this fungus in experiments with sterilized soil. It is discussed whether it will be possible to control *Polyporus annosus* biologically by green manuring, so that the actinomycete flora of the soil is stimulated or shifted in a direction adverse to the fungus. As such possibility appears to be reasonable, it is proposed to proceed with experiments of this kind.

ACKNOWLEDGMENTS

This investigation has received financial support by a grant from The Danish State General Research Foundation to Professor N. Fabritius Buchwald, The Royal Veterinary and Agricultural College, Copenhagen. I am indebted to Professor N. Fabritius Buchwald and to Dr. H. L. Jensen, the State Laboratory of Plant Culture, Lyngby, for valuable discussions of these problems.

REFERENCES

Benedict, R. G.: Antibiotics produced by actinomycetes. — Botan. Review 19: 229—320. 1953.

Björkman, E.: Soil Antibiotics acting against the root-rot fungus (Polyporus annosus Fr.). — Physiol. Plant. 1: 1—10. 1949.

Brian, P. W.: The use of antibiotics for control of plant diseases caused by bacteria and fungi. — Jour. Appl. Bacteriology 17: 142—151. 1954.

Dobbs, C. G. & W. H. Hinson: A widespread fungistasis in soils. — Nature 172: 197—199. 1953.

Enebo, L.: Experiments with Claviformin as an antibiotic against Polyporus annosus Fr. — Physiol. Plant. 2: 56—60. 1949.

Jefferys, E. G.: The stability of antibiotics in soils. — Journ. Gen. Microbiol. 7: 295—312. 1952.

Jefferys, E. G. & H. G. Hemming: Fungistasis in soils. — Nature 172: 872—873. 1953.

Landerkin, G. B. et al.: A study of the antibiotic activity of actinomycetes from soils of Norther Canada. — Canad. Jour. Res. C. 28: 690—698. 1950.

Lochhead, A. G. & G. B. Landerkin: Aspects of antagonisms between microorganisms in soil. — Plant and Soil 1: 271—276. 1949.

Meredith, C. H.: Soil actinomycetes applied to banana plants in the field. — Phytopathology 36: 983—987. 1946.

Millard, W. A. & C. B. Taylor: Antagonisms of microorganisms as the controlling factor in the inhibition of scab by green manuring. — Ann. Appl. Biol. 14: 202—216. 1927.

Nissen, T. Vincents: Om mikrobiel antagonisme og om antibiotica i jordbunden og mulighederne for praktisk anvendelse af disse faktorer. — Tidsskr. Planteavl 56: 633—659. 1953.

— : Effects of antibiotics on carbon dioxide production in soil. — Nature 174: 226—227. 1954.

— : Actinomycetes antagonistic to Polyporus annosus Fr. — Experientia 12: 229—230. 1956.

Rennerfelt, E.: The effect of soil organisms on the development of Polyporus annosus Fr., the root rot fungus. — Oikos 1: 65—78. 1949.

Rennerfelt, E. & Sheila K. Paris: Some physiological and ecological experiments with Polyporus annosus Fr. — Oikos 4: 58—76. 1952—53.

Rouatt, J. W., M. Lechevalier & S. A. Waksman: Distribution of antagonistic properties among actinomycetes isolated from different soils. — Antibiotics & Chemotherapy 1: 185—192. 1951.

Wright, Joyce M.: The production of antibiotics in soil. I. Production of gliotoxin by Trichoderma viride. — Ann. Appl. Biol. 41: 280—289. 1954.

Rothamsted Experimental Station: Report for 1954. — Nature 176: 1253—1254. 1955.

Copenhagen, February 1956.

BOLETINUS ASIATICUS SING. I FINLAND

Av WOLMAR NYBERG

Bland de svampar som jag för flere år sedan överlämnade till Helsingfors universitets botaniske museum i exsiccat fanns även *Boletinus cavipes* Opat. De voro tagna i en skogsdunge av någon gång i tiden planterade lärkträd, som uppenbarligan spritt sig ut över sitt egentliga område, i vilket åter talrika representanter för våra vanliga skogsträd trängt in. I dess centrum voro träden gamla, många redan döda. De första fynden gjordes i aug. 1930 och under åren 1931, 1932 och 1933 hade jag tillfälle att fortsättningsvis finna svampen där. Jag hade tyckt mig att det fanns två typer av arten. Den ena av dem, som jag för mig själv kallade var. *karmin* skilde genom vakkert karminröd hattfärg, mörkare sporer och något större dimensioner på dem från den mera i brunt gående formen. I „Karstenia", vår inhemska svampjournal, konstaterar numera professor R. TUOMIKOSKI (rättare redan 1953 i „Karstenia" II) att denna mera karminfärgade svamp är *Boletinus asiaticus* Sing. och att en så sällsynt främling — får man väl säga — funnit vägen till oss i Finland har ju ett visst interesse.

SUMMARY

Boletinus asiaticus Sing. found in Finland.

A short note is given about finds of the rare *Boletinus asiaticus* Sing. in Finland.

REFERENCES

Nyberg, W.: Några i Borgå och dess omnejd funna sällsyntare svamp-arter. — Memor. Soc. F. Fl. Fenn. 10: 20—23. 1934.

Tuomikoski, R.: Boletinus asiaticus Sing. in Finnland gefunden. — Karstenia 2:42. 1953.

Helsinki, Januar 1956.

INFECTION OF BARLEY BY LOOSE SMUT, USTILAGO NUDA (JENS.) ROSTR.

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INTRODUCTION

Since MADDOX (1895, 1897) discovered that barley could only be infected by *Ustilago nuda* through the flowers, other workers have observed mycelium of this fungus in the barley seed at various stages of its development. Thus HECKE (1905) found hyphae in the scutellum and hypocotyl of germinating seeds, and BREFELD (1905) noted that almost all the loose smut spores located on the stigma had germinated and the hyphae penetrated to the style tissue, but he was unable to follow the course of the fine mycelium filaments further. Later BREFELD (1907) reported hyphae to be present in both embryo and endosperm. FALCK (1908) like-wise discovered the presence of hyphae in the scutellum, the embryo and the tissues immediately surrounding. BROILI & SCHIKORRA (1913) examined germinated as well as dormant seeds and found an abundance of hyphae in the scutellum, and observed hyphae also in various parts of the embryo and hypocotyl as well as in leaf and bud primordia. A few years later LANG (1917) published the results of his investigations on the stages of infection by *U. nuda* in barley. His results which will be discussed later are briefly as follows: The spores germinate on the styles and follow the path of the pollen tube to the integuments which they follow to the embryo, or they germinate on the surface of the ovary, penetrate the ovary wall and the integuments and continue between the latter and the nucellar epidermis till they reach the embryo.

In seeds studied 12 days after inoculation RUTTLE (1934) found hyphae in the pericarp, in the crushed nucellus, in the aleuron and endosperm as well as in the scutellum and hypocotyl. The pericarp was invaded at various points along the ovary wall, especially in the brush end. In latter years, recognition of the fact that hyphae are present in the scutellum has been useful in the development of methods to demonstrate loose smut infection in certified seed barley.

It appears from this short review that most investigations coincide with regard to most points of the infection biology mentioned, but that there is some disagreement as to the actual place from which the penetration hyphae start. The present investigation is centered on this problem.

MATERIALS AND METHODS

In the summer of 1950, 400 heads of Rigel barley were inoculated according to the method of SHANDS (1940). Inoculation was performed immediately after flowering. From the date of inoculation till shortly before ripening, 10 heads were fixed daily. NAVASHIN's fluid (Cromic acid and formalin) was used for fixation, and the specimens were kept in 70 pct alcohol. During the winter of 1950—51 the fixed material was imbedded in paraffin wax, sectioned by microtome (15 μ), stained with safranin-lightgreen, mounted in Canada balsam, and examined. From this treatment very good slides resulted, the plasma-filled hyphae appearing a vivid red, which showed up well against the green cells of the host.

RESULTS

As early as 24 hours after inoculation many spores have fully developed promycelia, and some have developed even further, having long filaments of mycelium twisted around the spores (Fig. 1). The spores do not seem to germinate better on the styles than on the ovary. A count made on flowers with many germinated spores, shows a germination percentage of about 60 in both areas. Although there are large numbers of germinating spores on the styles, only one instance is noted in which the promycelium has entered the style tissue, whereas several cases of infection are observed on the surface of the ovary. In these latter cases appressoria-like swellings can be observed, from which vigorous pointed hyphae have entered the cells immediately below (Figs. 2—4). After 48 hours, the first hyphae have penetrated the epidermal cell layer and a few the subepidermal one

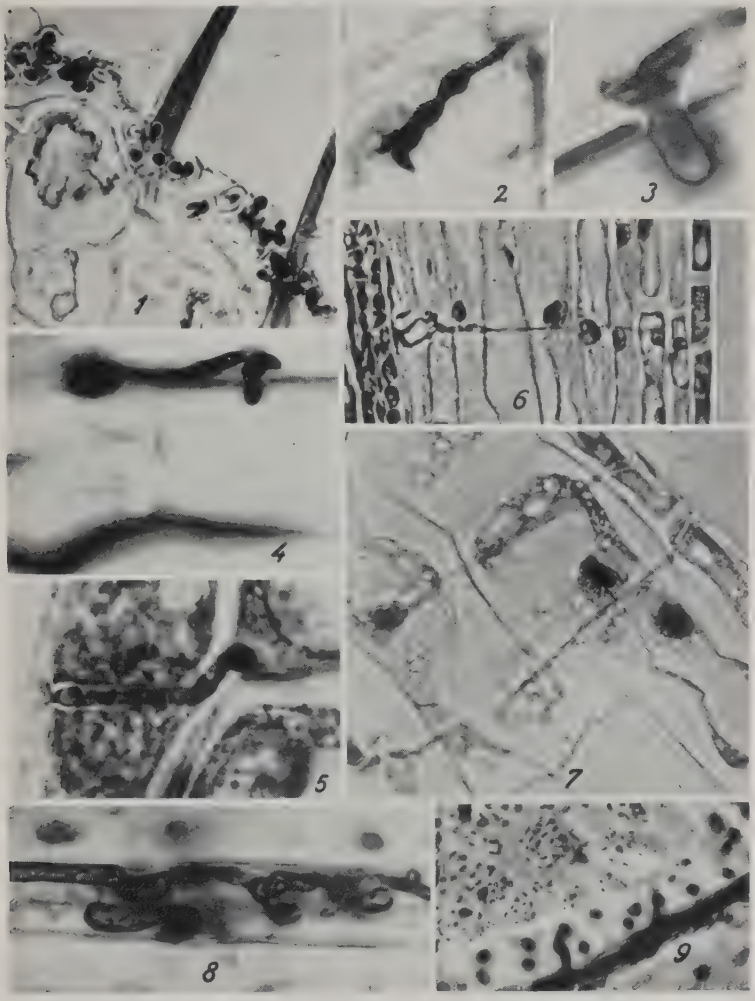

Fig. 1. Spores of *Ustilago nuda* (JENS.) ROSTR. germinating on the ovary wall near the brush end 24 hours after inoculation. — ×400.

Fig. 2. Hyphae with appressoria-like swellings on the ovary wall 24 hours after inoculation. At the lower part of Fig. 2 is seen the penetration hypha coming from the appressoria. — ×2000.

Fig. 3. Infection hypha 24 hours after inoculation. The pore in the cell wall which has appeared after the penetration of the hypha is smaller than the diameter of the hypha just inside the cell wall. — ×2300.

Fig. 4. Spore with promycelium, appressorium, and penetration hypha 24 hours after inoculation. — ×900.

Fig. 5. Infection hypha which has penetrated the epidermis and entered the subepidermis. Note smaller diameter of hypha at point of penetration. 48 hours after inoculation. — ×1300.

Fig. 6. Infection hypha running straight from the epidermis to the integuments. 5 days after inoculation. — ×225.

Fig. 7. Infection hyphae running parallel to each other. — ×400.

Fig. 8. Hyphae in the collapsed integuments. — ×1300.

Fig. 9. Hyphae in the integuments near the base of the embryo. — ×330.

Fig. 10. Hyphae in the scutellum and hypocotyl. 24 days after inoculation. — ×90.

(Fig. 5), and new infections, which seem to have been established within the preceding 24 hours, are observed. In the next few days the infection develops further, and additional new infections are noted. After 5 days the first hyphae have reached the integuments (Fig. 6), but the greater part of the hyphae, however, have not penetrated this far. Having reached the integumental layers, the hyphae branch off and proceed through these toward the embryo (Figs. 8—9). On the eighteenth day the first hyphae are found in the scutellum, and a few days later hyphae are plentiful in the embryo (Fig. 10).

The promycelium and the hyphae located outside the pericarp, with exception of the appressoria, have a much smaller diameter than the hyphae found within the pericarp, and they are only stained very lightly by the method used. Partly for this reason it was impossible to ascertain whether the appressoria had been formed by swelling of promycelia or by swelling of hyphae originating from the latter. In every instance of infection observed, the infection hyphae have penetrated the cell wall near the centre of the wall. The pore thus made by the infection hyphae is always smaller than the average diameter of the hyphae after penetration (Figs. 3—4). The oldest parts of the hyphae from early infections are often emptied of protoplasm. It is highly characteristic of hyphae from early infections that they grow directly towards the integuments. In several cases hyphae were seen to run parallel to one another toward the integuments from two closely situated foci of infection (Fig. 7). Having entered the integuments, the hyphae bend rather sharply and grow toward the embryo. The hyphae running on a straight course from the surface of the pericarp to the integuments have very few branches, or none at all. They seem to have no difficulties in penetrating cell walls, and they develop no swellings, or very small ones only, at the points of penetration (Figs. 6—7).

After a few days, the situation changes somewhat. Along with the hyphae travelling a straight course, as described above, several hyphae are now observed growing irregularly, with several branches and bulbous swellings. On penetrating cell walls, these hyphae form large, irregular swellings, often shaped like a dumb-bell (Figs. 13—14). Swollen U-shaped hyphae located next to the cell wall are frequently noted within the cells. At a later stage, large areas are seen in which all cells are invaded by hyphae. Such areas are found in all parts of the pericarp from the brush end to the chalaza region. Having reached the region where the scutellum adjoins the integuments, the hyphae

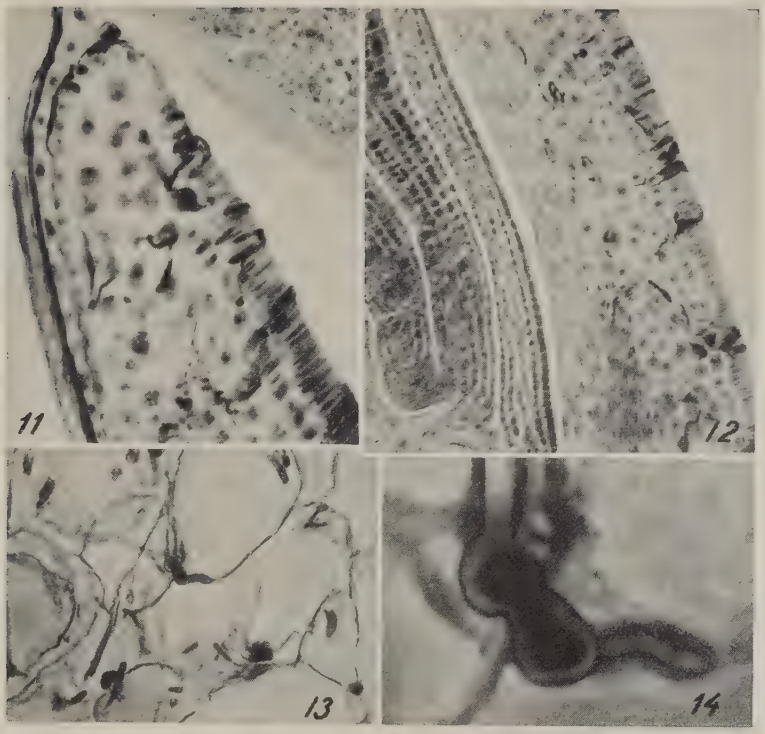

Fig. 11. Infection in the upper part of the scutellum. 24 days after inoculation. — ×180.

Fig. 12. Heavily infected scutellum. — ×120.

Fig. 13. Hyphae in the upper part of the pericarp 18 days after inoculation. At this time, large swellings of the hyphae appear upon penetration of the cell walls. — ×340.

Fig. 14. Detail from Fig. 13. — ×1700.

branch off and enter the scutellum. At this time the diameter of the hyphae tends to increase. Many hyphae are now present in the layer of collapsed cells lying between endosperm and the outer cell layer of scutellum. This epidermal cell layer consists of long, epithelial-like cells whose distal ends are adjacent to the endosperm. Here too, the hyphae form a vigorous network, and frequently large areas are seen to be completely interwoven with hyphae. The hyphae

then proceed further into the epithelial layer (Fig. 12) and continue up through the hypocotyl (Fig. 10). In the week prior to ripening, hyphae are present in all parts of the embryo. Most are observed in the hypocotyl and leaf primordia; some, however, are also found in root primordia. At this stage, hyphae are furthermore not uncommon in the endosperm, especially at the base.

DISCUSSION

As mentioned in the introduction, the mycelium of *U. nuda* has often been found in barley seed at various stages of its development. The observations published by various authors coincide in most respects. There is, however, as mentioned before some disagreement regarding the place of the primary infection and the route of the hyphae to the young embryo. It is the object of this investigation to shed some light on these points. It has not been possible to confirm LANG'S assertion that infection takes place through the styles as well as through the pericarp; in the material used here infection only takes place through the pericarp. It is highly unlikely that, in the material examined, a possible path of infection through the styles could remain unobserved, as the contrast staining used was extremely effective as regard all other parts of the material, and there is no reason why the same should not apply to the styles. However, to exclude the possibility that the staining method should have failed in the styles, a large part of the material was also examined by phase contrast microscop but nothing was found. LANG'S statement that pericarpial cells are frequently destroyed by the fungus could not be confirmed, and this applies also to his allegation that very few hyphae are present in the embryo, an allegation which also is inconsistent with the findings of HECKE. Furthermore, LANG'S theory to the effect that the thin epidermis surrounding the young embryo should protect the latter against the early phases of hyphal invasion, making it impossible for the fungus to reach the embryo except through the epithelial cells of the scutellum at a late stage of embryonal development, must be doubted, as in several instances hyphae were observed coming from the integument, penetrating the scutellum "from behind" and finally reaching the epithelial cells of that body.

According to the results presented in this paper, the following hypothesis seems more probable. During its early growth, the embryo secretes substances (growth-hormones?) which chemotactically attract the fungus hyphae. Via the epithelial layer of the scutellum and

the integuments, these substances by diffusion enter the pericarp. About a week after pollination the chemotactic action is much lessened and the substances probably no longer reach the pericarp.

This hypothesis would explain several of the observed peculiar features. Due to chemotactic attraction, the early infection hyphae will strive to reach the integuments, hence their straight course of travel. The hyphae of later infections, which are not in the same degree subject to this chemotactic influence develop irregularly and erratically, with large swellings upon penetration of cell walls. These swellings are strongly reminiscent of the appressoria-like swellings found outside the pericarp which appear at a time when they cannot be affected by any substance secreted by the embryo.

Consistent with this hypothesis is furthermore the fact that, having reached the integuments, the hyphae branch off and follow the integuments toward the embryo instead of going through the endosperm, frequently a much shorter route. The hypothesis also explains why hyphae are often seen in the endosperm at a later stage, since by this time there is no longer any chemotactic attraction.

SUMMARY

The previously held theory that barley may be infected with *U. nuda* through the styles should be discarded. The result of the present investigation shows that the hyphae penetrate the pericarp and enter the integuments which they follow to the scutellum. Through the scutellum they finally reach the embryo.

REFERENCES

Brefeld, O. (1905): Untersuchungen aus dem Gesamtgebiete der Mycologie XIII.

— (1907): Über die Brandkrankheiten des Getreides. — Jahrb. d. Deutch. Landw.-Ges. 22: 75—84.

Broili, J. & Schikorra, W. (1913): Beiträge zur Biologie des Gerstenflugbrandes. — Ber. Deutsch. Bot. Ges. 31: 336—339.

Falck, R. (1908): Die Flugbrandarten des Getreides, ihre Verbreitung und Bekämpfung. — Journ. f. Landw. 56: 173—182.

Hecke, L. (1905): Zur Theorie der Blüteninfektion des Getreides durch Flugbrand. — Ber. Deutsch. Bot. Ges. 23: 248—250.

Lang, W. (1917): Zur Ansteckung der Gerste durch Ustilago nuda. — Ber. d. Deutsch. Bot. Ges. 35: 4—20.

Maddox, F. (1895): Experiments at Eastfield. Dept. Agric., Tasmania. — (1897): Notes and results on agricultural experiments carried on under the auspices of the council of Agriculture of Tasmania at Eastfield, Newhavn. Tasmania.

Popp, W. (1951): Infektion in seeds and seedlings of wheat and barley in relation to development of loose smut. — Phytopath. 41: 261—275.

Russell, R. C. (1950): The whole embryo method of testing barley for loose smut as a routine test. — Scient. Agr. 30: 361—366.

Russell, R. C. & Popp, W. (1951): The embryo test as a method of forecasting loose-smut infection in barley. — Scient. Agr. 31: 559—565.

Ruttle, M. L. (1934): Studies on barley smuts and on loose smut of wheat. — N. Y. Agr. Exp. Sta. Tech. Bull. 221.

Shands, H. L. (1940): Wisconsin Agr. Exp. St. Bull. 449, p. 74. (Description of inoculation method).

Simmonds, P. M. (1946): Detection of the loose smut fungi in embryos of barley and wheat. — Scient. Agr. 26: 51—58.

Copenhagen, February 1956.

YIELD EXPERIMENTS WITH MUSHROOMS CULTIVATED ON SYNTHETIC COMPOST OR HORSE AND PIG MANURE SUPPLEMENTED WITH VARIOUS SUBSTANCES

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From June 1954 to January 1955 and from February 1955 to October 1955 two identical experiments were carried out with the cultivation of mushrooms in the experimental houses of the Mushroom Laboratory under the Royal Veterinary and Agricultural College, Copenhagen. The object of these experiments was to establish the difference between the yields from three synthetic composts, two horse manure composts and one pig manure compost. Furthermore, in both experiments two casing soil types were tested, one of them a meadow soil, rich in humus, which had given the highest yield in previous experiments, and the other, used for comparison, a very stiff clayey soil (potter's clay). Finally, an investigation was made of the difference in yields obtained by growing on shelves and by growing in trays, as well as of the effect of pasteurization on the yield.

PLAN OF EXPERIMENTS

A. — Horse manure (control).

Addition per ton of fresh manure:

4 kilos ammonium sulphate (at stacking)
15 - fodder lime (at 1st turn)
4 - superphosphate plus 15 kilos gypsum (at 2nd turn)

B. — Horse manure (+ 50 %).

Addition per ton of fresh manure:

6 kilos ammonium sulphate (at stacking)
22.5 - fodder lime (at 1st turn)
6 - superphosphate plus 22.5 kilos gypsum (at 2nd turn)

C. — M. R. A. (100 % blood meal)[1])

Per 1000 kilos of dry wheat straw:
10 kilos ammonium sulphate (preparation of straw)

Act.[2]) X (at stacking)	150.0 kilos	blood meal
	6.5 -	superphosphate
	16.0 -	gypsum
	6.5 -	potassium sulphate
	22.5 -	fodder lime
Act. Y (at 1st turn)	340 grammes	magnesium sulphate
	340 -	iron sulphate
	42 -	aluminium sulphate
	42 -	copper sulphate
	32 -	zinc sulphate
	32 -	boric acid
	32 -	ammonium molybdate
	14 -	chromium sulphate
	7 -	potassium bromide
	7 -	potassium iodide
Act. Z (at 2nd turn)	6.5 kilos	superphosphate
	32.0 -	gypsum

D. — M. R. A. (50 % blood meal)[3])
Per 1000 kilos of dry wheat straw:
10 kilos ammonium sulphate (preparation of straw)

Act. Xa (at stacking)	75.0 kilos	blood meal
	20.0 -	urea[4])
	6.5 -	superphosphate
	16.0 -	gypsum
	6.5 -	potassium sulphate
	22.5 -	fodder lime
Act. Y (omitted)[5])	6.5 kilos	superphosphate
	32.0 -	gypsum

E. — Pig manure[6])

Addition per ton of manure:
4 hectolitres brewers grains plus 4 kilos ammonium sulphate (at stacking)
15 kilos fodder lime (at 1st turn)
4 - superphosphate plus 15 kilos gypsum (at 2nd turn)
(30 - gypsum (at 4th turn))

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1) A detailed description of M. R. A. (Mushroom Research Association's formula) compost is given in "Gartnertidende", Copenhagen, No. 4/1953.
2) Act. = Activator.
3) In the 2nd experiment a further amount of 75 kilos blood meal was added at the 4th turn.
4) According to English statements, urea gives, in general, a lower yield than does blood meal.
5) Omission of Activator Y (the micronutrients) should, theoretically, enhance the chance of tracing a decrease in the yield, thus proving the indispensability of these substance.
6) In the 2nd experiment neither brewers grains nor ammonium sulphate was added at the set-up. Furthermore, 30 kg gypsum were omitted at the 4th turn.

F. — Brewers grains compost

Per 1000 kilos of wheat straw:
10 kilos ammonium sulphate (preparation of straw)

Act. Xb (at stacking)	15	hectolitres brewers grains plus 5 kilos ammonium sulphate
Act. Ya (at 1st turn)	40	kilos fodder lime
	340	grammes magnesium sulphate
	340	- iron sulphate
	42	- aluminium sulphate
	42	- copper sulphate
	32	- zinc sulphate
	32	- boric acid
	32	- ammonium molybdate
	14	- chromium sulphate
	7	- potassium iodide
	7	- potassium bromide
Act. Za (at 2nd turn)	12	kilos superphosphate
	40	- gypsum

According to the plan of experiments, the object was to investigate (1) whether it would be possible to increase the yield by an extra addition of chemicals to horse manure than had been used so far; (2) whether any difference in yields from the two M. R. A. composts could be traced when 50 % of the blood meal was replaced with urea while the micronutrients were omitted; (3) whether, after all, the M. R. A. composts were able to give the same yields as the tried-out horse manure composts (according to the British Mushroom Laboratory, the two M. R. A. composts give the same yield — at any rate when micronutrients are added — and they are on a level with horse manure composts); (4) whether it is possible to produce a synthetic compost, but at a considerably lower cost of materials; and, finally (5) whether pig manure lends itself to be used as a culture medium at all.

COMPOSTING

Composting of the culture medium for the 1st experiment was carried out under favourable climatic conditions in the summer of 1954, and everything turned out approximately as expected. In the 2nd experiment, however, composting took place under unfavourable climatic conditions (in the winter of 1955 with very severe frost), and in particular it proved difficult to make the M. R. A. composts absorb sufficient heat, which involved a displacement of the dates prefixed for the stackings for simultaneous termination of the fermentation; the treatments which were completed first therefore had

to be "stored" for a shorter or longer period, until filling and pasteurization could be carried out simultaneously.

Table 1 gives the numbers of days and turns required before the individual composts could be considered ready for filling.

TABLE 1

	1st experiment		2nd experiment	
	No. of days	No. of turns	No. of days	No. of turns
A: Horse manure (control)	14	4	24	5
B: - - + 50 %	14	4	24	5
C: M. R. A. (100 % blood meal)	17	4	49	7
D: M. R. A. (50 % - -)	19	4	49	7
E: Pig manure	17	5	28	5
F: Brewers grains compost	18	4	30	5

For each of the three synthetic composts (C, D and F), 1000 kilos fresh wheat straw were used, which were pre-fermented by addition of the ammonium sulphate and large quantities of water before the actual stacking with activators (vide the Plan of Experiments). For the two sorts of horse manure, 2000 kilos fresh racing stable manure were used, while 3000 kilos pig manure were employed.

The compost heaps were stacking as normal for the substratum concerned and covered with straw mats on the sides and at the ends. All turns were performed meticulously but otherwise as is done in practice. The additives were spread as evenly as possible, and a turning machine was used at all turns. The dates for the turns were, as a rule, determined by the changes in temperature, the formation of the actinomycetes and the relative humidity. Great importance was attached to the proper supply of water during the turns.

TABLE 2

Water percentages (averages of 3 samples)

		A	B	C	D	E	F
Shelf house:							
At filling	1*)	70	70	79	77	66	78
	2*)	72	71	79	77	72	79
At spawning	1	64	63	74	74	46	75
	2	70	68	79	74	70	78
Tray house:							
At filling	1	70	69	79	78	64	77
	2	72	71	80	77	73	79
At spawning	1	67	66	77	76	48	76
	2	69	68	78	75	71	79

*) 1 = 1st experiment. 2 = 2nd experiment.

TABLE 3

pH readings (averages of 3 samples)

		A	B	C	D	E	F
Shelf house:							
At filling	1*)	7.5	7.4	7.4	7.4	8.2	7.1
	2*)	6.9	6.8	6.7	6.6	6.6	6.6
At spawning	1	7.3	7.2	7.1	7.4	7.8	7.3
	2	7.0	7.0	6.9	7.4	7.4	7.0
Tray house:							
At filling	1	7.5	7.4	7.4	7.3	8.1	7.2
	2	6.9	6.8	6.5	6.6	6.8	6.8
At spawning	1	7.5	7.3	7.3	7.4	7.8	7.2
	2	7.3	7.5	7.6	7.5	7.5	7.3

Tables 2 and 3 indicate the water percentages and the pH-values, respectively, at the filling and at the spawning. The six treatments were filled partly on shelves and partly in trays after having been intimately mixed shortly before. All the while, compost was taken out alternately from each heap both for shelves and trays. The experiments were laid out with systematic plot distribution and with six repetitions in the shelf house (72 m^2 bed surface) and 8 repetitions in the tray house (56 m^2 bed surface). The area of each plot in the shelf house was 1 m^2, while the area of each frame was only ½ m^2. On an average, 80 kilos compost were filled per square metre of bed surface.

After filling, the trays were stacked in a specially designed pasteurizing room, and immediately thereafter the so-called "peak-heating" (pasteurization) was commenced, steam being piped into the shelf house and the tray room from a steam locomobile, while the central heating lines were fully open.

In the 1st experiment, it took 10—12 hours for the temperature to rise to the desired 60—61° C, and pasteurization was terminated after some 50 hours at this temperature. In the 2nd experiment, it took 20—22 hours to reach the temperature of about 60° C, and the steam was turned off after 75 hours.

The mushroom spawn was planted when the temperature had dropped to 30° C in the composts. After another 21 days, the plots were cased with the two types of soil. At the same time the trays were stacked for growing in an adjacent room. In both rooms the tempera-

*) 1 = 1st experiment. 2 = 2nd experiment.

TABLE 4 YIELDS

A = Horse manure (control) C = M. R. A. (100 % blood meal) E = Pig manure 1 = 1st experiment
B = Horse manure (+ 50 %) D = M. R. A. (50 % blood meal) F = Brewers grains compost 2 = 2nd experiment
o = clayey soil b = meadow soil H = shelves K = trays

Combination		No of days from planting to gathering		1 st period 28 days kg/m²		2 nd period 28 days kg/m²		3 rd period 34 days kg/m²		Normal picking period 1: abt. 90 days 2: abt. 90 days						H less K
										Shelf house			Tray house			
		H	K	H	K	H	K	H	K	kg m²	Grames mush rooms	Increase in yield m²	kg m²	Grames mush rooms	Increase in yield m²	kg m²
Ao	1	37	38	8.3	5.6	4.9	5.0	4.2	3.7	17.4	12.6	0	14.3	12.2	0	+3.1
	2	41	42	8.3	8.2	2.8	4.8	4.7	6.9	15.8	12.2	0	19.9	12.3	0	—4.1
Bo	1	37	37	9.2	8.2	5.1	5.2	4.5	4.3	18.8	13.1	+1.4	17.7	13.3	+3.4	+1.1
	2	39	41	8.7	7.5	3.9	5.1	4.6	7.3	17.2	12.2	+1.4	19.9	12.4	0	—2.7
Co	1	38	37	6.0	5.1	4.5	4.2	4.5	4.5	15.0	15.1	—2.4	13.8	14.1	—0.5	+1.2
	2	41	43	4.0	4.1	1.8	2.6	3.5	4.5	9.3	13.1	—6.5	11.2	12.9	—8.7	—1.9
Do	1	39	39	4.7	4.1	4.7	4.2	5.8	5.6	15.2	14.8	—2.2	13.9	15.1	—0.4	+1.3
	2	44	44	2.7	1.6	1.7	2.3	3.5	3.8	7.9	12.5	—7.9	7.7	10.2	—12.2	+0.2
Eo	1	(60)	(60)	0.4	0.4	1.1	0.6	1.3	0.6	2.8	12.2	—14.6	1.6	12.1	—12.7	+1.2
	2	45	45	5.9	5.8	3.8	5.4	3.5	5.5	13.2	12.3	—2.6	16.7	12.5	—3.2	—3.5
Fo	1	38	38	4.4	4.5	3.6	3.3	4.1	3.5	12.1	15.1	—5.3	11.3	12.1	—3.0	+0.8
	2	41	42	3.5	4.1	2.6	3.1	4.7	5.4	10.8	13.6	—5.0	12.6	13.3	—7.3	—1.8
Ab	1	35	38	9.6	7.8	5.7	5.5	4.0	4.1	19.3	11.8	0	17.4	11.7	0	+1.9
	2	39	40	8.8	9.2	3.4	5.4	6.4	7.4	18.6	11.3	0	22.0	11.3	0	—3.4
Bb	1	35	37	11.2	8.7	6.1	5.4	4.9	4.2	22.2	11.8	+2.9	18.3	10.9	+0.9	+3.9
	2	37	41	9.4	7.6	3.7	5.1	5.5	7.4	18.6	11.4	0	20.1	11.2	— 1.9	—1.5
Cb	1	38	36	6.0	4.8	4.3	4.0	5.9	4.5	16.2	13.5	—3.1	13.3	13.3	—4.1	+2.9
	2	38	41	4.5	3.9	2.6	2.4	4.2	5.4	11.3	11.9	—7.3	11.7	11.4	—10.3	—0.4
Db	1	38	39	5.0	4.4	5.8	4.6	7.0	5.6	17.8	13.6	—1.5	14.6	13.0	—2.8	+3.2
	2	40	45	3.0	1.5	2.9	2.5	4.9	4.1	10.8	11.5	—7.8	8.1	10.3	—13.9	+2.7
Eb	1	(60)	(60)	0.7	1.4	1.4	1.5	1.3	1.5	3.4	10.6	—15.9	4.4	10.8	—13.0	—1.0
	2	42	44	6.3	6.4	3.1	5.2	5.4	6.3	14.8	10.9	—3.8	17.9	11.2	—4.1	—3.1
Fb	1	36	38	5.3	4.5	3.9	3.4	3.9	3.8	13.1	11.7	—6.2	11.7	13.7	—5.7	+1.4
	2	37	40	3.7	3.7	2.8	3.4	4.9	6.6	11.4	12.9	—7.2	13.7	11.4	—8.3	—2.3

ture was lowered gradually to about 16° C and the ventilation was increased gradually so as to correspond to complete air renewal 2 or 3 times an hour. In the 1st experiment, all the composts, with the exception of pig manure, were almost transpierced by spawn. In the 2nd experiment, the two M. R. A. composts had a considerably poorer growth than the other treatments.

The mushrooms ripe for picking from the individual plots were counted, weighed and recorded daily. The normal picking period extended over about 90 days.

Table 4 represents the results of the pickings. In the first column a combination of compost treatment and casing soil is indicated. The second column contains the number of days which passed from the spawning to the picking of the first ripe mushrooms. The following three column show the results from shelves and trays in the 1st picking period (28 days), the 2nd period (the next 28 days), and the 3rd period (about 34 days). Finally, the total yield, the average weight per mushroom, and the increase (decrease) in yield in comparison with the control (horse manure with normal addition). In the last column the difference between the yields from shelves and trays is given.

NORMAL PICKING PERIOD

Experiment 1.

(a) Shelf house

The highest total yield was noted for the B manure (+ 50 %) cased with meadow soil, viz. 22.2 kilos per square metre, and in comparison with the control manure (A) cased with the same soil the increase in yield was 2.9 kilos per square metre, and 1.4 kilos when clayey soil is used for the casing. The best synthetic compost was D: M. R. A. (50 %), though the difference is but slight. A comparison of the best synthetic compost and the best horse manure (B + 50 %) cased with meadow soil shows a difference of 4.4 kilos per sq. metre. The F compost cased with meadow soil gave 9.1 kilos less per sq. metre than the best horse manure. Altogether, the meadow soil has given a somewhat larger increase in yield than the clayey soil — in a single case up to over 3 kilos per sq. metre. Both soils seem, however, to be very suitable. Considering the column for grammes per mushroom, it is evident that, irrespective of the casing soil, the two horse manure composts give the lowest weight and thus the poorest quality. All mushrooms picked from clayey soil plots give heavier weights than those from the meadow soil.

(b) Tray house

Here, almost the same conditions prevailed as in the shelf house. The two horse manures were best, and the B manure (though cased with clay soil) gave an increase in yield of 3.4 kilos per sq. metre. Also D: M. R. A. (50 % blood meal) gave slightly higher yields than C: (100 % blood meal). F: Brewers grains compost gave a comparatively low yield. Generally, the difference between the test treatments was lower in the tray house than in the shelf house.

Experiment 2.

(a) Shelf house

In the total picking period the yields were, on an average, somewhat lower than in the 1st experiment. The two horse manures gave the highest yields (A: control, 18.6 kilos per sq. metre cased with meadow soil); and they proved equally good when cased with meadow soil, whereas B: + 50 % gave 1.4 kilos more per sq. metre with meadow soil. The two M. R. A. composts gave a considerable decrease, as was expected. C. (100 % blood meal) was somewhat better than D (50 % blood meal) with 11.3 kilos per sq. metre cased with meadow soil. The pig manure proved surprisingly good, with a yield only 3—4 kilos lower than that obtained with the horse manures. Of the synthetic composts, F: brewers grains compost was best 11—12 kilos per sq. metre, but the difference between brewers grains compost and the M. R. A. composts was comparatively small, considering that the brewers grains compost fermented satisfactorily, whereas the M. R. A. composts, and particularly the D compost, were all but abandoned. In this experiment, the meadow soil gave about the same yield as in the 1st experiment. The average weight per mushroom was considerably lower in this experiment, and it was also obvious that the quality was poorer, but it was once more established that clayey soil gives a better quality than does meadow soil.

(b) Tray house

The variation within the five treatments was almost the same as in the shelf house; however, there was no increase in yield for B: + 50 % — on the contrary, the control A cased with meadow soil gave 1.9 kilos more per sq. metre (22.0 kilos altogether).

In the last column in the left-hand main section (H less K) of Table 4 the difference between the yields from shelves and trays is stated. In the 1st experiment the shelves gave a somewhat higher yield than the trays; but in the 2nd experiment the reverse is the case, the trays generally giving surprisingly high increases in yields. It will probably be difficult to account for this fact, but the difference may be due to a more or less optimal fresh-air supply during peak-heating, even though it was impossible in any of the experiments to established this by comparison of the pH readings, the water percentages and the growth of the spawn at casing time. It is quite likely, however, that the difference is caused by other factors.

In addition to the normal number of trays used in the experiments. several trays were left unpasteurized, and Tables 5 and 6 show the increases in yield which were obtained by pasteurization. In most cases the increases in yield are quite appreciable, proving that the extra work and expenditure pay many times over.

DISCUSSION

The two experiments did not agree very well, which, in the first place, must be ascribed to the abnormal fermentation in the 2nd experiment. Altogether, it may be said that the horse manures suffered no deterioration by the long storage time before the filling. Whereas in the 1st experiment a fairly constant increase in yield was obtained with an extra 50% of the additive which was used in control A, this was not pronounced in the 2nd experiment. However, it is impossible to say whether this is due to the abnormal conditions or to other things, or whether the increased yield in the 1st experiment is accidental; but for the present it cannot be recommended to add 50% of chemicals in relation to the control with "normal" addition, in the hope of obtaining a higher yield. Nor is it possible to say whether the extra addition may give greater security in cultivation. In the 1st experiment it is interesting to note that although half of the nitrogen has been applied in the form of urea, and the micronutrients have been left out, the M. R. A. (50 % blood meal) has nevertheless given the highest yield in the total picking period. In the 2nd experiment there is upwards of 3 kilos more per sq. metre for M. R. A. (100%) as compared with M. R. A. ("50%") less micronutrients, but, considering the comparatively low yields altogether and the very abnormal course of the fermentation, the

TABLE 5

Increases in yield by pasteurization (peak heating).
Experiment 1.
kg/m² on 90 days' picking.

	Ab	Ao	Bb	Bo	Cb	Co	Db	Do	Fb	Fo
+ pasteurization	17.4	14.4	18.3	17.7	13.3	13.8	14.6	13.9	11.7	11.3
— pasteurization	11.4		15.0		7.4		8.1		8.8	
Average increase in yield by pasteurization	4.5		3.0		6.1		6.1		2.7	

TABLE 6

Trays.
Increases in yield by pasteurization (peak heating).
Experiment 2.
kg/m² on 90 days' picking.

	Ao	Ab	Bo	Bb	Co	Cb	Do	Db	Eo	Eb	Fo	Fb
+ pasteurization	20.4	24.1	20.5	21.6	13.0	13.4	6.2	9.2	15.7	18.1	12.7	14.3
— pasteurization	16.7	15.8	17.8	17.9	9.5	8.0	9.2	8.0	16.0	14.0	10.9	10.5
Increase in yield	+3.7	+8.3	+2.7	+3.7	+3.5	+5.4	÷3.0	+1.2	÷0.3	+4.1	+1.8	+3.8

2nd experiment actually shows nothing concrete beyond the fact that M. R. A. compost requires favourable conditions to be a complete success, and that M. R. A. (100 % blood meal) fares slightly better under unfavourable climatic conditions than when half blood meal and half urea are used.

F: Brewers grain compost, has not given particularly high, though fairly equal, yields in the two experiments. It should be observed, however, that the brewers grains compost fermented excellently, even under the unfavourable climatic conditions, and apparently there is good reason to use brewers grains as kind of a "starter" and then add suitable nitrogen sources. The two experiments demonstrate clearly that the brewers grains compost lacks one or more "substances" to give yields comparable to those obtained with horse manure — but what substances, and in what quantities, can only be found by future experiments.

Whereas the pig manure in the 1st experiment failed to give good results owing to various causes, the 2nd experiment showed that good yields can be obtained if manure from pig herds with normal feeding and wheat-straw litter is used — and with a likelihood of more constant yields than with the use of the synthetic compost used in Europe today.

In both experiments the interesting observation is made for the synthetic compost, particularly D and C in the 1st experiment, that the yields are increasing from period to period. This certainly tends to indicate that: (1) some sort of fermentation takes place during growing, (2) or the composting / "peak heating" has been inadequate, (3) or the mushroom spawn can somehow "decompose" the compost (say, by enzymes) during cultivation.

SUMMARY

1. The horse manures proved superior to all other compost.

2. An extra addition of 50% of the inorganic substances used in the control had no consistent effect on the yield.

3. Under favourable climatic conditions the M. R. A. compost gave fairly good yields, but they are uncertain when composting is done during spells of severe frost.

4. The brewers grains compost fermented excellently under all climatic conditions, but yields were too low in comparison with those obtained with horse manures.

5. Fairly good yields are obtainable if a good wheat-straw littered pig manure is used.

6. It is generally alleged that lower yields are obtained by growing in trays, but the experiments demonstrated that this need not always be so.

7. The meadow soil gave the highest yield, but the poorest quality of mushrooms.

8. Pasteurizing of the composts gave considerably increased yields in most cases.

Copenhagen, February 1956.

THE NATURAL RESISTANCE TO DECAY OF CERTAIN CONIFERS

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A number of conifers contain heartwood which is strongly resistant to insects, termites and fungi while in others the heartwood can be destroyed almost as easily as the sapwood. It is now generally accepted that this natural resistance depends to very great extent on the occurrence of specific constituents which are laid down during the formation of the heartwood. Through the extensive investigations of, in the first place, ERDTMAN and his co-workers (ERDTMAN 1953, 1955) many of these substances have been isolated and their chemical constitution determined. In some cases it has also been shown that these compounds have strong fungicidal properties; pinosylvin, nootkatin and the thujaplicins inhibit decay fungi on an agar substrate in 0.01 —0.001 % concentrations (RENNERFELT & NACHT 1955).

In the present investigation the resistance to decay of the heartwoods of a number of conifers has been tested. The wood samples were kindly provided by Professor H. ERDTMAN, Stockholm. The rotting tests have been carried out with three commonly used fungi, namely *Coniophora puteana, Lentinus lepideus* and *Poria vaporaria;* four different samples of each kind of wood were tested over a period of four months by the LEUTRITZ' soil method.

From the results in Table 1 it may be seen that different species of conifers have very different resistances to decay. The following species show g r e a t d u r a b i l i t y: *Actinostrobus pyramidalis, Cedrus deodara, Chamaecyparis nootkatensis, Ch. pisifera, Cupressus Lawsoniana, Libocedrus* spp., *Podocarpus totara, Sequoia sempervirens, Thuja plicata* and *Widdringtonia whytei.* In one or two cases one of the three fungi, principally *Coniophora puteana,* has been able to attack the wood although neither of the other fungi had any appreci-

Table 1

Durability of some conifer heartwoods

No.	Species	Density of the dry wood	Per cent loss in weight caused by			Per cent moisture content after decay
			Con. put.	Lent. lep.	Poria vap.	
1	*Actinostrobus pyramidalis*	0.68		2.8	0.1	31.1
2	*Agathis alba*	0.58	19.4	23.3	24.6	47.3
3	*Araucaria imbricata*	0.54	30.4	23.9	30.2	51.7
4	*Cedrus deodara*	0.40	9.5	2.4	2.5	28.6
5	*Chamaecyparis nootkatensis*	0.48	18.1	1.5	1.2	40.0
6	— *pisifera*	0.36	20.5	1.7	6.3	28.4
7	*Cryptomeria japonica*	0.54		22.1	25.1	46.6
8	*Cupressus Lawsoniana*	0.52	4.2	4.2	6.5	61.7
9	*Fitzroya patagonica*	0.34		2.5	16.5	30.3
10	*Juniperus communis*	0.52	30.7	12.0	21.0	63.2
11	*Larix decidua*	0.55	24.4	29.3	32.6	58.9
12	*Libocedrus Bidwillii*	0.35	21.5	0.7	3.6	37.5
13	— *chilensis*	0.51	1.6	0.7	0.8	31.4
14	— *decurrens*	0.38	3.3	0.7	0.6	23.1
15	*Pilgerodendron uviferum*	0.45		1.8	2.7	31.5
16	*Podocarpus totara*	0.51		1.3		31.2
17	*Sequoia sempervirens*	0.42	2.8	2.9	3.0	75.2
18	*Sequoiodendron giganteum*	0.29	23.6	1.5	12.1	42.1
19	*Taxus baccata*	0.59	22.7	13.7	23.2	39.8
20	*Thuja plicata*	0.27	5.7	1.9	0.8	33.4
21	*Widdringtonia whytei*	0.42	0.4	1.9	1.8	28.4
22	*Pinus silvestris*	0.63	25.9	30.5	34.2	54.4
23	— — sapwood	0.62	67.6	42.0	50.3	64.7

able effect. The following species can be classed as of low or moderate resistance: *Agathis alba, Araucaria imbricata, Juniperus communis, Larix decidua* and *Pinus silvestris. Taxus baccata* also suffered considerable attack. Field tests by other investigators (Smith 1949, Graham 1954) have given results which agree well with these laboratory tests.

As already mentioned resistance to decay depends on the occurrence of chemical compounds in the heartwood. As can be seen from Fig. 2 the decay resistant woods, with the exception of *Actinostrobus pyramidalis,* do not have a particularly high density; the very durable *Thuja plicata* has the lowest density.

Table 2

Resinous appearence and heartwood constituents of the conifers

No.	Species	Resinous appearance	Heartwood constituents
1	*Actinostrobus pyramidalis*	—	not investigated
2	*Agathis alba*	—	- —
3	*Araucaria imbricata*	—	- —
4	*Cedrus deodara*	+	sesquiterpenes, *e. g.* atlantone
5	*Chamaecyparis nootkatensis*	—	nootkatin*), carvacrol*), chamic acid*), chaminic acid*), sesquiterpenes
6	*Ch. pisifera*	+	sesquiterpenes, no tropolones
7	*Cryptomeria japonica*	(+)	diterpenes, sesquiterpenes
8	*Cupressus Lawsoniana*	?	little investigated; no fungicidal compounds known
9	*Fitzroya patagonica*	—	unknown; considerable amounts of »tannins«
10	*Juniperus communis*	—	diterpenes, sesquiterpenes; no fungicidal compounds known
11	*Larix decidua*	—	lariciresinol, taxifolin
12	*Libocedrus Bidwillii*	—	nothing known
13	— *chilensis*	+	one per cent β-thujaplicin*)
14	— *decurrens*	—	carvacrol*), hydrothymoquinone, thymoquinone*), libocedrol
15	*Pilgerodendron uviferum*	(+)	sesquiterpenes; no tropolones; not yet possible to explain decay resistance
16	*Podocarpus totara*	—	totarol (probably not active)
17	*Sequoia sempervirens*	—	considerable »tannins«, pinitol, sequoyin *etc.*
18	*Sequoiodendron giganteum*	—	unknown
19	*Taxus baccata*	—	isotaxiresinol (not active)
20	*Thuja plicata*	—	α-,β-,γ- thujaplicin*), thujic acid
21	*Widdringtonia whytei*	+	sesquiterpenes, sesquiterpene alcohols
22	*Pinus silvestris*	—	pinosylvin*), pinobanksin, pinocembrin

*) toxic to fungi.

The summary in Table 2 gives a list of the compounds known to occur (ERDTMAN 1955) in the conifer heartwoods examined in the present investigation. Nootkatin, carvacrol, chamic acid, α-, β- and γ-thujaplicin, thymoquinone, pinosylvin etc. have been shown to have fungicidal properties (Fig. 1). In a number of cases e. g. sesquiterpenes, which sometimes occur in relatively large amounts, fungicidal activity could not be detected with the method used. In other cases e. g. with *Fitzroya patagonica* and *Sequoia sempervirens* the resistance

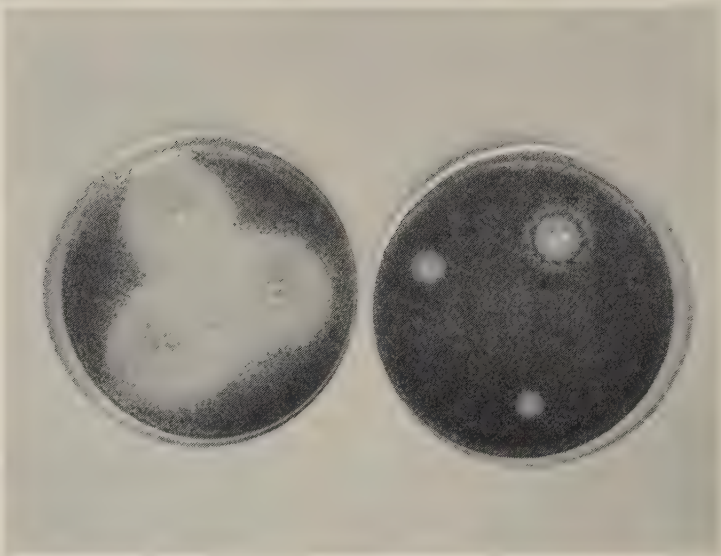

Fig. 1. Effect of pinosylvin (left) and nootkatin (right) on the growth of the blue stain fungus *Pullularia pullulans.*

to decay must be connected at least partly with the occurrence of tannins.

Certain physical properties should assist this resistance in some types of heartwood. In a number of trees the wood is rich in oil which thus renders it water-repellent. Four of the species examined, namely *Cedrus deodara, Chamaecyparis pisifera, Libocedrus chilensis* and *Widdringtonia whytei,* are noted for their oiliness. The curves for water content (Fig. 2) show that the water uptake of the wood of these species was small as estimated in the pieces of wood after exposure to rotting with *Lentinus lepideus* for four months.

There appear to be two methods for the protection of heartwood. In one, poisonous, somewhat water-soluble substances (nootkatin, pinosylvin, thujaplicins etc.) have been deposited — as in *Chamaecyparis nootkatensis, Libocedrus chilensis, L. decurrens* and *Thuja plicata* — in the other the wood is impregnated with oily, water-repellent substances. In certain cases heartwood is impregnated in both ways as in *Libocedrus chilensis* which has been found in this investigation to be the most resistant type of wood. It is both resinous and contains not less than 1 % β-thujaplicin (ca 5 kg/m^3).

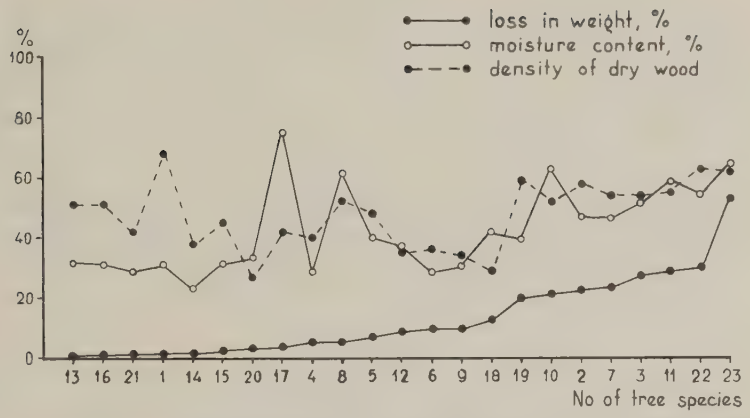

Fig. 2. Loss in weight, moisture content after decay and density for 22 different conifer woods (cf. Table 1).

A parallel can be drawn with modern methods of wood preservation — creosote is partly water-repellent, partly poisonous, while substances used in salt impregnation are principally poisonous to insects and fungi.

SUMMARY

About twenty conifers have been examined for decay resistance by the LEUTRITZ' soil method. The occurrence of poisonous substances has been shown in some species while others contain water-repellent oils or a combination of both oils and poisonous substances.

LITERATURE CITED

Erdtman, H. (1953): Über einige Inhaltsstoffe des Kernholzes der Coniferenordnung Pinales. — Holz als Roh- und Werkstoff 11: 245.

— (1955): The Chemistry of Heartwood Constituents of Conifers and their Taxonomic Importance. — Experientia Supplementum II: 156—180, Basel/Stuttgart.

Graham, R. D. (1954): Service life of treated and untreated fence posts. — Oreg. For. Prod. Lab., Corvallis Prog. Rep. No. 8.

Rennerfelt, E. & Nacht, G. (1955): The fungicidal activity of some constituents from heartwood of conifers. — Svensk Bot. Tidskr. 49: 419—432.

Smith, D. N. (1949): The natural durability of timber. — Forest Prod. Research Records, No. 30.

Stockholm, February 1956.

SOME FUNGI OCCURRING ON DIED-BACK TOPS AND BRANCHES OF PICEA ABIES AND ABIES SPP. IN WESTERN NORWAY

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With many interruptions, the author has for some years made studies on an apical die-back of Norway spruce *(Picea abies* (L.) KARST.). In its typical appearance it is characterized by the leader and the youngest branch whorl and the upper part of the last year's internodium being dead, just as in the top necrosis once described from Sweden by LAGERBERG (1913). By less advanced attack the leader and branch whorl still carry healthy bark and green needles while a more or less broad belt on the stem, most often on the last year's internodium, exhibits dead and resin-soaked bark and yellow or wilted needles. Thus the die-back is initiated by a girdling of the main axis, just as stated by LAGERBERG for the corresponding disease described by that author.

Tops showing the initial stage of attack carried no external signs of fungal growth. Culture tests demonstrated that the bark had already been invaded by fungi, however. On the tops already dead a more or less abundant vegetation of fungal fructifications flourished. From causes briefly referred to in two earlier pamphlets (ROBAK 1952 a and b) none among the fungi met with can be considered the causal organism of the disease.

It is not my intention now to deal with the etiology of the latter. I should only think it of interest to mycologists to get a brief account on the species of fungi encountered during my work with the problem in question because our knowledge of the distribution of *Micromycetes* on conifers in Fenno-Scandia is still rather incomplete (for closer information on that subject see f. i. JØRSTAD 1945 and KUJALA 1950).

For the same reason I include in my list some findings made in connection with a dieback of branch ends observed on several species of *Abies*.

Unfortunately, my list can give only a very deficient knowledge of the fungus flora really occuring. Partly, this is due to the fact that a great number of mycelia isolated in culture have been unidentifiable. Further one must have in mind that in the beginning taxonomical studies were of only secondary interest to me compared with the etiological problem. Therefore, some of the species which I observed during my first examinations of died-back tops and which, owing to their obvious unimportance as possible causal organisms, I studied only superficially, could not be recovered by renewed examination of the top samples. Among the mycelia forming pycnidia in culture some lost their fertility so quickly that specialists to which I sent them for identification were not able to get much out of them any longer. Others formed pycnidia of such an abnormal structure that identification had in any case to be rather hypothetical.

Fig. 1. Map of Western Norway. Localities mentioned in text numbered in succession.

In the following account a quotient in parentheses tells on how many of the examined samples the species has been observed. In cases of fungi little known in artificial culture I have given a brief description of their cultural characters. When nothing particular is said about the medium used, the

latter has been malt agar with 3 % malt extract and 2 % agar agar.

Of synonyms I have quoted only the most important ones.

List of collection localities mentioned in text.

Parish:	*Locality:*	*No. on the map:*
Bolsøy	Bårdalen	3
Eid i Romsdal	Torviken	4
Evanger	Evanger Priest yard-Forest	19
Fana	Kismul	23
„	Stend	22
Fjaler	Dale	6
„	Hellebust State Forest	7
„	Svinevik	8
Førde	Førde Priest-yard Forest	5
Gaular	Døskeland	9
„	Senneset	10
Hyllestad	Systad	11
Jondal	Hallaråkershagan	25
Jostedal	Jostedal Priest-yard Forest	15
Kyrkjebø	Osland in Bjordal	13
„	Tangen at Vadheim	12
Luster	Alsmo	16
„	Berteig	18
„	Sørheim	17
Os	Ekhaug at Syfteland	24
Surnadal	Heggset	2
Tingvoll	Gyl	1
Vik	Nessedalen	14
Voss	Bjørke	20
„	Møen	21

Hymenomycetes

Only in one case hymenomycetous fructifications have been observed on the samples. At Dale in Fjaler parish, on one among 20 examined spruce tops collected 31.3.1948, were observed small, sterile fructifications closely resembling those of *Corticium laeve* Pers. (Syn. *C. evolvens* Fr.). From the border of necrosis of the same top was isolated a mycelium which I am very much inclined to identify with that of the species in question the culture characters of which I have studied quite closely before (Robak 1942). There is but little doubt that our fungus is *C. laeve*.

From another sample collected in the same locality 8.11.1947 the same mycelium has been isolated together with another hymenomycete which remained unidentified.

Finally, from one among three tops received from Gyl in Tingvoll parish 13.6.1949 a mycelium was isolated which had very much in

common with that of *Stereum sanguinolentum* (A. & SCHW.) FR. but which carried its clamp connections singly at the septae and not in pairs or whorls as is obviously always the case in *S. sanguinolentum* (ROBAK 1942, NOBLES 1948).

These findings might indicate that the die-back may in some cases serve as a way of entrance to apical decay in the stem.

DISCOMYCETES

1. Cenangium ferruginosum FR. (Syn. *C. abietis* (PERS.) DUBY) ?

On *Picea abies:*

Os parish, Ekhaug at Syfteland 14.4.1948 (3:3).

As far as I know, *C. ferruginosum* has never been reported from spruce before. Therefore, I hesitated in identifying the examined specimens with that species, the more so as their colour (exterior almost yellow-grey !) was much lighter than normally observed in the last-named one when growing on pines. Actually, however, I think this colour (which may to some extent be due to their somewhat immature state) was the only characteristic distinguishing our apothecia from those of *C. ferruginosum*. The distinguished expert on arboricolous fungi in Norway, Dr. I. JØRSTAD, thought their microscopical features showed good agreement with that species. The apothecia occurred in small groups near the base of the dead part of the tops. Bark cultures from the same areas yielded mycelia different from that of *C. ferruginosum,* however (cultural characteristics see GREMMEN 1952).

PYRENOMYCETES

2. Diaporthe eres NKE. sens. WEHMEYER

Isolated from *Picea abies:*

Fjaler parish, Dale 8.11.1947 (1:1), fructifications obtained in culture identified by L. E. WEHMEYER.

As is well known, WEHMEYER operates with very wide species limits within the genus *Diaporthe* (WEHMEYER 1933). His *D. eres* covers 12 among the *Diaporthe* species noted by WINTER (1887). Obviously, however, WEHMEYER thinks those species to be more or

less distinct forms whereas he considers WINTER's only conifer-inhabiting species *D. occulta* (FCKL.) entirely identical with *D. conorum* (DESM.) NIESSL and the total of other species described from coniferous hosts. Following WEHMEYER, one should think my fungus belongs to *D. occulta* and, indeed, Dr. WEHMEYER's identification reads: *"D. eres (D. occulta)"*.

However, *D. occulta* and *D. conorum* being identical, my fungus then ought to have *Phomopsis occulta* (SACC.) as its pycnidial stage (HAHN 1930). Unfortunately, it seems that it has not. Certainly, my cultures exhibited a certain agreement with HAHN's description of his cultures of *P. occulta* but differed from the same by (a. o.) the total absence of B-conidia (stylospores) in the pycnidia. Nor did the A-conidia (Fig. 2 d.) agree quite satisfactorily with HAHN's pictures and measurements. Dr. HAHN himself would only confirm that my fungus "certainly looks to be a *Phomopsis*". Our A-conidia measured 5.2—8×1.8—2.4 μ.

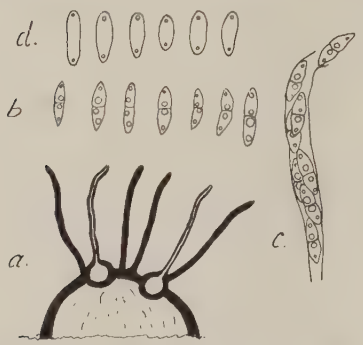

Fig. 2. *Diaporthe eres* NKE. sens. WEHMEYER. (subsp. *occulta* ?). a. Perithecial stroma on malt agar (×7.5). b. Ascospores and c. bursting ascus with spores (both × 500). d. Pycnospores (×1000).

The *Diaporthe* stage occurred on malt agar slants — the perithecia then placed in groups on semiglobular stromata — as well as on sterilized pine twigs in which case the perithecia developed on extended, stratum-like stromata as in nature. As is seen (Fig. 2), the perithecia (400—550 μ in width) differ from those of *D. eres* by their long, slender ostioli, a property which Dr. WEHMEYER would ascribe to the moist conditions existing in the culture tubes. I do not feel quite sure that this holds true because perithecia did not develop till the agar had been desiccated and the aerial mycelium had since long collapsed.

Ascospores measured: 13—17.5×2.2—4.0 μ, Asci max. 60 μ.

The fungus confirms the very complicated taxonomy of the *Diaporthe-Phomopsis* group and I think it altogether unadvisable to make any attempt to describe it as a distinct form or variety on the base of one single isolation.

3. Nectria cucurbitula (Tode) Fr.

On *Abies alba* and *A. Nordmanniana:*

Os parish, Ekhaug at Syfteland 26.5.1948 and 24.1.1949.

On *Abies concolor:*

Fana parish, Kismul July 1947 and 26.5.1948.

Mycelium isolated from the mentioned species and localities and from *A. balsamea,* Ekhaug 24.1.1949.

As previously reported the fungus has occurred in its imperfect stage only *(Cylindrocarpon cylindroides* var. *tenue* Wollenw.), apart from one case of abundant vegetation of perithecia on a twig of *A. alba* having been dead since more than one year. The mycelium was isolated from numerous twigs recently dead or girdled and is considered the causal agency of the die-back in question (Robak 1951).

Sphaeropsidales

4. Coniothyrium corticola Vestergr. (Syn. *C. rostellatum* Grove p. p.)

On *Picea abies:*

Førde parish,	Førde priest-yard forest	21.3.1948 (1:1)
Gaular „ ,	Senneset School	31.3.1948 (1:2)
Fjaler „ ,	Dale	31.3.1948 (1:20)
Fana „ ,	Kismul	26.5.1948 (1:1)

Isolated from the bark of *P. abies:*

Luster parish,	Alsmo	8.11.1947 (1:4)
Fjaler „ ,	Dale	12.2.1948 (1:2)
„ „ ,	Svinevik	1.4.1948 (1:2)
„ „ ,	Hellebust state forest	1.4.1948 (1:1)
Gaular „ ,	Senneset school	31.3 and 3.4.1948 (3:6)
„ „ ,	Døskeland saw-mill	31.3.1948 (4:6)
Jondal „ ,	Hallaråkershagen	April—May 1948 (1:2)
Bolsöy „ ,	Bårdalen state forest	May 1948 (1:3)
Os „ ,	Ekhaug at Syfteland	14.4 and 26.5.1948 (2:9)
Tingvoll „ ,	Sandvika at Gyl	8.6.1948 (3:4)
Voss „ ,	Bjørke	March—April 1948 (1:3)
„ „ ,	Møen	14.12. 1948 (1:1)

Material of pycnidia from Senneset was identified by the distinguished expert on *Sphaeropsideae* Dr. F. Petrak, Vienna, as *C. corticola* Vestergr. According to his informations this species may be identical to *C. glomerulatum* Sacc. with which I identified our fungus myself. Obviously, it has a wider distribution than might be indicated by the comparatively few findings of pycnidia on the natural material.

Cultures: Mat with even, fringed margin, aerial mycelium woolly-barby, faintly curled, 3—4 mm. high, colour mostly light-grey with a faint red-orange tinge. Daily radial increment at room temp. 2.3—3 mm. Pycnidia often abundant, of normal shape and structure (Fig. 3 a) or more often of a very loose, ball-like texture and nearly whitish colour, in both cases developing conidia of normal size and shape, 2.8—5×2.4—3 μ (Fig. 3 b).

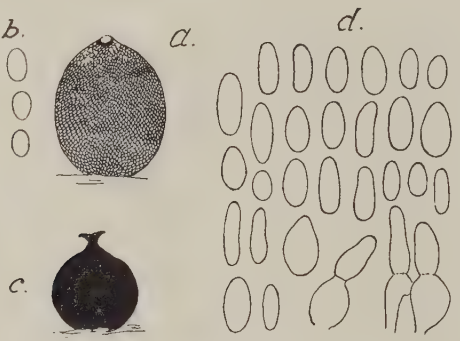

Fig. 3. a.—b. *Coniothyrium corticola* VESTERGR.
a. pycnidium (×50). b. conidia (×1000).
c.—d. *Coniothyrium dispersellum* KARST.
c. pycnidium (× 25).
d. conidia and conidiophores (×1000).
Both species from agar cultures.

5. Coniothyrium dispersellum KARST.

Isolated from the bark of *Picea abies:*

Luster parish, Alsmo 29.11.1947 (1:3)

This identification was confirmed by Dr. PETRAK.

Cultures:

On malt agar mat low, with even margin. Aerial mycelium barby-woolly, dark olive green (Ostw. li 3), in repeatedly transplanted cultures often absent, mat then jet-black to dark orange-red. Daily radial increment at 16—20° C. ab. 2 mm. in fresh isolates, later 1.5—1.6 mm.

On oat-meal agar and corn-meal cane sugar agar the substratal mycelium is characterized by an orange to egg-yellow colour gradually spreading from inoculum and also pervading the oat-meal medium itself. On both media scattered, black pycnidia after 2—3 months,

exuding black drops of conidia. The brown-olive-coloured spores measured 4.5—9.2×2.8—4.6μ. Size and shape extremely variable. (Fig. 3 c—d).)

6. Cytispora abietis (Sacc.) ?

On *Picea abies:*

Hyllestad parish, Systad	February 1948 (1:2)
Fana „ , Kismul	26.5.1948 (1:1)
Gaular „ , Senneset school	3.4.1948 (2:4)

Isolated from the bark of *Picea abies:*

Gaular parish, Senneset school	3.4.1948 (1:4)

7. C. Curreyi (Sacc.) ?

Isolated from the bark of *Picea abies:*

Gaular parish, Senneset school	3.4.1948 (1:4)

8. C. Mougeotii Lév.

On *Picea abies:*

Fjaler parish, Dale	31.3.1948 (1:20)
Gaular „ , Senneset school	31.3 and 3.4 1948 (2:6)

Isolated from the bark of *Picea abies* from the same localities on the same occasions.

Partly, these identifications must be considered rather uncertain. Of what is here called *Cytispora abietis* the natural material was very scanty, so that only culture material (partly on sterilized twigs) was sent Dr. Petrak for identifications. His opinion regarding the Systad material of this fungus was as follows: "*C. abietis* Sacc., identification very doubtful". Of the Senneset material he writes: "*C. abietis* Sacc. Development entirely abnormous".

Of our *C. Mougeotii* Dr. Petrak received natural material from both localities quoted above. He identified both samples as *C. Mougeotii*. Of the Senneset fungus he writes: "*Cytospora Mougeotii* Lév. Stimmt am besten mit dieser Art überein, die aber zweifelhaft und wahrscheinlich mit *C. abietis* oder *C. Curreyi* identisch ist". *(C. M.,* shows the best agreement with this species which seems to be dubious and most probably identical to *C. abietis* or *C. Curreyi,* however).

Our supposed *C. Curreyi* (culture material) Dr. Petrak refers to *C. Mougeotii.*

I think it justified, however, to keep the name *C. Mougeotii* only for the material quoted under that name above. For the same material

Dr. PETRAK's identification has confirmed my own. Among the *Cytispora* species described from coniferous hosts none is noted to have conidia as long and narrow as observed in our fungus, with the only exception of *C. Mougeotii*. The conidia (Fig. 4 a) have measured 5.5—7×0.6—0.8 (1.0) μ. They are exuded in slimy, white masses. Mycelium on malt agar appressed, with a low, felty, white to cream-coloured aerial growth. Daily radial increment at room temp. 3—4.5 (5) mm.

In shape of the conidia and in cultural characteristics this fungus has been distinctly different from the remaining two forms.

Of these, the one for which (following PETRAK's suggestion) I have chosen the name *C. abietis* exhibits dingy-yellow spore masses just as noted by ALLESCHER (1901) and GROVE (1935) for that species. The conidia (Fig. 4 b—c) measure 4.5 — 6 × 1 — 1.4 μ (abnormally shaped individuals from malt agar cultures up to 8—9 μ). Cultures: Mat appressed, margin even, with very low, felty to mealy, grey-brown (Ostw. ge2—ig2) air mycelium. Daily radial increment at room temp. 6—7.5 mm.

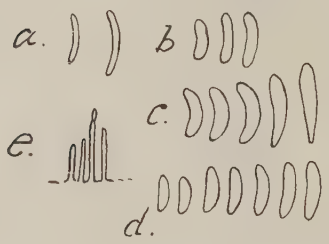

Fig. 4. Pycnospores and sporophores of *Cytispora* from culture pycnidia.
a. C. Mougeotii LÉV. — *b. C. abietis* (SACC.) (?) from Systad. — *c.* do. from Senneset. — *d.—e. C. Curreyi* SACC. (?). — (×1330).

For the third fungus I have proposed *C. Curreyi* SACC. mainly because of its brick-red spore masses (LIND says purplish, acc. to GROVE 1935) and its entirely simple conidiophores (Fig. 4 e). In my other two *Cytispora* forms the conidiophores have been very variable and most often abnormal in shape and thus of very little help to the identification work. Individually, the conidia (Fig. 4 d) resemble quite closely those of our *C. abietis*. Dimensions 4.1—6.3×1—1.3 μ. Cultures: Mat appressed, with deeply lobed margin, brown-black with little or no aerial mycelium, daily radial increment at room temp. normally 10—15 mm. Self-staling is often pronounced, however, and may lead to early suppression of the growth.

Pycnidia have developed rather abundantly in all three species (or varieties?) on malt agar and on sterilized twigs. Most often they have appeared as large black stromata, more or less like gigantic magnifications of natural *Cytispora* pycnidia.

9. Dothichiza pithyophila (Cda.) Petr. (Syn. *Sclerophoma pithyophila* (Cda.) Hoehn.)

On *Picea abies:*

Fjaler parish, Dale	31.3.1948 (3:20)
Kyrkjebø „ , Tangen at Vadheim	30.3.1948 (2:5)
Luster „ , Berteig	April 1948 (2:8)
„ „ , Sørheim	21.2.1948 (2:2)
Gaular „ , Senneset school	31.3.1948 (1:2)
Bolsöy „ , Bårdalen state forest	May 1948 (1:3)

On *Abies Nordmanniana:*

Os parish, Ekhaug at Syfteland 26.5.1948 and 24.1.1949.

Isolated from the bark of *Picea abies:*

Fjaler parish, Dale	12.2.1948 (1:2)
„ „ , „	31.3.1948 (3:20)
„ „ , „	16.6.1948 (1:2)
Gaular „ , Døskeland saw-mill	31.3.1948 (1:6)
Kyrkjebø „ , Tangen at Vadheim	30.3.1948 (1:2)
Luster „ , Berteig	April 1948 (5:8)
Bolsöy „ , Bårdalen state forest	May 1948 (1:3)
Tingvoll „ , Sandvika at Gyl	8.6.1948 (2:4)

The mycelium of *D. pithyophila* is of the *Pullularia pullulans* type and certainly identical with *Hormonema dematioides* Lagerberg et Melin (Robak 1952 a).

Its cultural characteristics are well known from the comprehensive description given by Lagerberg, Lundberg & Melin (1927).

I have never succeeded in obtaining pycnidia in culture. From USSR Nazarowa (1936, p. 1208) describes cultures of *Sclerophoma pithyophila* developing pycnidia and open acervuli. She does not mention the formation of conidia by direct budding from the hyphal walls which is so characteristical to the *P. pullulans* type of mycelia. Consequently, I doubt that her identification is correct. By me numerous cultures have been made from spores exuded by pycnidia within material the identification of which has been confirmed by Dr. Petrak (the Senneset and Sørheim samples).

However, pycnidia resembling very much *D. pithyophila* occurred abundantly in one culture isolated from the bark of a died-back spruce leader from Bjørke at Voss 20.4.1948 and, in fact, Dr. Petrak was inclined to identify those culture pycnidia as *D. pithyophila.* However, the mycelium was of a type entirely different from that of the *pithyophila* mycelia otherwise isolated by me. It was very slow-growing, daily radial increment at room temp. 0.5—0.8 mm. against nearly 5 mm. in fresh isolates of *D. pithyophila,* and exhibited no formation of conidia from the hyphae. A pycnidiferous mycelium of almost

identical appearance was isolated from spores of pycnidia observed on one sample among the tops sent me from Berteig in Luster April 1948. The natural pycnidia differed from those of *D. pithyophila* mainly in their decidedly smaller size, their somewhat more narrow conidia and their superficial position. Unfortunately, the fertility of the culture strain rapidly declined, and Dr. PETRAK could not find any fertile pycnidia when he received cultures for identification.

Owing to other work I could not spare time for persecuting the problem of the identity of those two strains. I have mentioned them here only to show that pycnidiferous fungi exist which resemble *D. pithyophila* closely enough to be mistaken for that species and which are, nevertheless, distinct. Most probably, NAZAROWA has happened to meet with such a fungus.

10. Sclerophoma entoxylina LAGERBERG et MELIN

Isolated from the bark of *Picea abies:*

Fjaler parish,	Dale	16.6.1948 (1:2)
Vik „ ,	Nessedalen valley	24.4.1948 (2:2)

This fungus which has been described on culture material only has been so comprehensively dealt with by its authors that identification of cultures of the same can be made without difficulty. I refer to the original description (LAGERBERG, LUNDBERG & MELIN 1927).

11. Phomopsis conorum (SACC.) DIED.

On *Picea abies:*

Evanger parish,	Evanger priest-yard forest	June 1948 (1:3)
Fjaler „ ,	Dale	31.3.1948 (4:20)
Gaular „ ,	Døskeland saw-mill	31.3.1948 (2:6)
Jondal „ ,	Hallaråkershagan	April—May 1948 (2:2)
Os „ ,	Ekhaug at Syfteland	26.5.1948 and 24.1.1949 (2:7)
Voss „ ,	Bjørke	April 1948 (1:3)

Isolated from the bark of *Picea abies:*

Fjaler parish,	Dale	12.2.1948 (1:2)
„ „ ,	„	31.3.1948 (7:20)
„ „ ,	„	16.6.1948 (1:2)
Gaular „ ,	Døskeland saw-mill	31.3.1948 (1:6)
Os „ ,	Ekhaug	14.4.1948 (2:3)
„ „ ,	„	26.5.1948 (4:6)
Luster „ ,	Berteig	April 1948 (1:8)
Bolsöy „ ,	Bårdalen state forest	May 1948 (1:3)

Of this fungus and its cultural characteristics HAHN (1930) has delivered such a full description and such excellent drawings that identification is simple. My material has in all details agreed with HAHN's data (v. Fig. 5 a—c). In one case the natural pycnidia contained B-conidia only. Otherwise a varying proportion of A-conidia were present.

12. Phomopsis montanensis HAHN ?

Isolated from the bark of *Picea abies:*

Luster parish, Alsmo	8.11.1947 (1:3)
Tingvoll „ , Sandvika at Gyl	8.6.1948 (1:4)

Here, my identification has been made with much hesitation. The cultural characteristics agree quite well with those described by HAHN (1930) for his species. My observations are: Mycelium very slow-growing, daily radial increment at room temp. 0.1—0.5 mm., mat at first appressed, glabrous, colourless to faintly sulphur yellow, later olive. After 4—6 weeks covered (often around inoculum only) by a very low, felty, greyish-white aerial growth. Pycnidia abundant after ab. 2 months. HAHN's statements differ mainly in the fact that his *P. montanensis* developed pycnidia after two weeks, a character which does not seem essential. A more severe objection is that A-conidia did not occur in my material. My pycnospores agreed in shape and size with the B-conidia of HAHN's fungus (Fig. 5 d), however. The fact that they could not be brought to germination speaks in favour of the assumption that they are B-conidia. As mentioned above, also *P. conorum* happens to occur without A-conidia. The structure of my culture pycnidia was not more abnormal than that their belonging to the genus *Phomopsis* seemed altogether possible. Unfortunately, the fertility of my strains declined very rapidly, and Dr. HAHN could not get much out of cultures I sent him for identification.

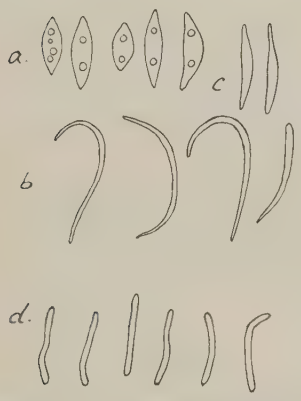

Fig. 5. a—c: *Phomopsis conorum* (SACC.) DIED. A- and B-conidia and intermediates. *d. P. montanensis* HAHN (?), B-conidia. — (×1000).

13. Phomopsis pseudotsugae WILS. (Syn. *Discula pinicola* (NAUMOW) PETR.)

Isolated from the bark of *Picea abies:*

Fjaler parish, Dale	12.2. and 31.3. 1948 (5:22)
Gaular „ , Døskeland saw-mill	31.3.1948 (2:6)
Os „ , Ekhaug at Syfteland	26.5.1948 (1:6)
Tingvoll „ , Gyl	8.6.1948 and 13.6.1949 (3:7)
Bolsøy „ , Bårdalen state forest	May 1948 (1:3)

Apart from an earlier communication by the author (ROBAK 1952 b) *Phomopsis pseudotsugae* has — under that name — never been reported from spruce. Under the name *Discula pinicola* it is well known however, as a blueing fungus in pine and spruce wood and in ground-wood pulp of spruce as well (LAGERBERG, LUNDBERG & MELIN 1927, ROBAK 1932). That the two names are synonyms has been confirmed by HAHN (ROBAK 1952 b). Thus, my isolations demonstrate that *P. pseudotsugae* must be relatively wide-spread as a saprophyte on spruce although this host does not form a favourable medium for its fructification.

The culture characteristics of the fungus have been described by HAHN (1930) and — very comprehensively — by LAGERBERG & MELIN (l. c.).

14. Zytostroma pinastri (KARST.) HOEHN. (Syn. *Zythia pinastri* KARST.)

On *Picea abies:*

Gaular parish, Døskeland saw-mill	31.3.1948 (1:6)
Jostedal „ , Jostedal priest-yard forest	June 1948 (1:4)

Isolated from the bark of *Picea abies:*

Fjaler parish, Svinevik	1.4.1948 (1:2)
Gaular „ , Døskeland saw-mill	31.3.1948 (4:6)
„ „ , Senneset school	31.3. and 3.4.1948 (3:6)
Jondal „ , Hallaråkershagan	April—May 1948 (1:2)
Voss „ , Bjørke	March—April 1948 (1:3)
Bolsøy „ , Bårdalen state forest	May 1948 (1:3)

Identification confirmed by Dr. PETRAK for the Døskeland material. Cultures: Mat at first appressed, glabrous, later gradually covered by a low, white, cottony air mycelium of a loose texture. Daily radial increment at room temp. 3 mm. Pycnidia not observed. Conidia forming directly from the mycelium. Also this fungus seems to be more widely distributed than expected from the sparse occurrence of its pycnidia.

15. Hormococcus conorum (SACC. et ROUM.) n. comb. (Syn. *Sirococcus conorum* SACC. et ROUM.)

Isolated from *Picea abies:*

Hyllestad parish, Systad near Leirvik 13.12.1947

The cultures carried superficial, globular, less than 0.5 mm. broad, black, pore-less pycnidia the almost globular, hyaline spores of which were formed in chains from bottle-shaped to cylindrical, hyaline sterigmata and measured ab. $2 \times 2 \mu$, each spore having one oil guttule (Fig. 6 a). These observations agree so well with ALLESCHER's description of *Sirococcus conorum* (ALLESCHER 1901, p. 445) that I do not hesitate in identifying our fungus with that species.

The mycelium grows very slowly on malt agar. Daily radial increment at room temp. ab. 0.4 mm. Mat dense, almost glabrous and colourless, with even margin. Pycnidia on the fresh isolate numerous, crowded.

There is no doubt that this species and the following are far from being nearly related to each other. *Sirococcus conorum* is not the type species of the genus and ought to be given another generic name. I have here proposed *Hormococcus* n. g.

16. Sirococcus strobilinus (DESM.) PETR. (Syn. *Sporonema strobilinum* DESM., *Discella strobilina* (DESM.) DIED., *S. strobilinus* PREUSS (?), *Ascochyta parasitica* (HART.) ROSTR. (?), *A. piniperda* LINDAU (?) a. o.)

On *Picea abies:*

Fjaler parish,	Dale	31.3.1948 (1:20)
„	„ , Hellebust state forest*)	1.4.1948 (1:1)
Gaular	„ , Senneset school*)	31.3. and 3.4.1948 (2:6)
?Luster	„ , Berteig	April 1948 (1:8)
Vik	„ , Nessedalen valley	24.4.1948 (2:2)
Voss	„ , Bjørke	March—April 1948 (1:3)

Isolated from the bark of *Picea abies:*

Fjaler parish,	Dale	31.3.1948 (1:20)
Luster	„ , Berteig	April 1948 (1:8)
Os	„ , Ekhaug at Syfteland	26.5.1948 (1:6)
Vik	„ , Nessedalen	24.4.1948 (1:2)

JØRSTAD (1945) considers *Discella strobilina* (DESM.) DIED. identical to *Ascochyta piniperda* LINDAU and *A. parasitica* (HART.) ROSTR.

*) Material examined by Dr. PETRAK, who confirmed the identification.

In my opinion, the material resting in the Herbarium of the Botanical Museum of Oslo university supports this view. What separates the specimens given the species names in question is only the different habitat from which they have been collected (i. e. cones or twigs !).

HARTIG'S illustrations of his *Septoria parasitica* (HARTIG 1890) show spores which — according to the magnification noted — measure ab. 12.5—14.5×ab. 2½—3 μ. For *Sporonema strobilinum* DESM. ALLESCHER (1903) notes: 10—15×2.5—3 μ. For the Norwegian material (referred to both species names) JØRSTAD quotes: 9.5 — 15×2 — 2.5 (— 3) μ. Within my own material (Fig. 6 b) the Bjørke specimens had spore dimensions like 9.8—17.2×3—4 μ and the Nessedalen specimens 9.8 — 19.8 × 3 — 4 μ (where two-celled spores are concerned). For Danish material of *A. parasitica* (HART.) ROSTR. FERDINANDSEN & JØRGENSEN (1938) note 13—15×5—6 μ, i. e. obviously broader conidia then ever described for *Sirococcus strobilinus*. In this respect their figures differ just as much from HARTIG'S original illustrations of *S. parasitica,* however. Thus, this slight difference in spore width which seems to be the only noticeable difference between the shoot-inhabiting fungus of the Danish authors and the cone-inhabiting *S. strobilinus* is most probably due to inter-regional variability only. Obviously, some of my own specimens are in the said respect intermediate.

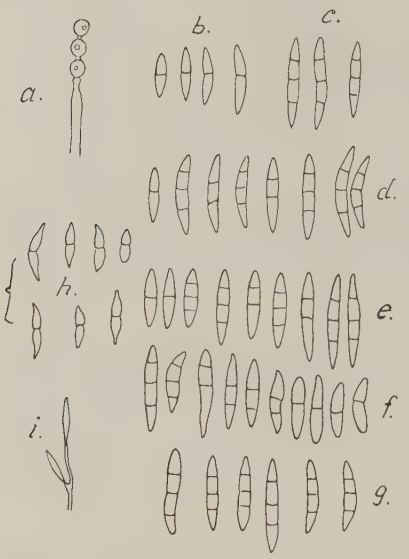

Fig. 6. a. *Hormococcus conorum* (SACC. et ROUM.) n. comb. Conidia and conidiophore (×1000).

b.—f. *Sirococcus strobilinus* (DESM.) PETR. Main form; b. Conidia from natural pycnidia; c.—f. Conidia from culture pycnidia of different isolations. (×500).

g. *Sirococcus strobilinus* (?) deviating type from natural pycnidium. Berteig in Luster, with exclusively quadricellular conidia. (×500).

h.—i. *Sirococcus strobilinus* var. *acutisporus*. Conidia and conidiophore with young conidia. (×500).

A peculiarity of my material is, however, that many pycnidia contained a small proportion of 3—4-celled conidia, the length of which was correspondingly greater, i. e. up to 30 μ. (Fig. 6 c—f). In pycnidia developed in culture such big and otherwise strange-looking conidia often dominated entirely, particularly in mycelia having been cultivated for a more extended period.

The mycelium of *Sirococcus strobilinus* on malt agar develops a slow-growing mat with even margin and low, felty-woolly, yellow-green (Ostw. ne2—pg2 or in sectors ig2) aerial mycelium. Daily radial increment at room temp. 0.7—1.6 mm. Pycnidia sometimes occur on malt agar, abundantly when a sterilized spruce twig is partly embedded in the agar slant.

Two forms differing more or less markedly from the rest have been met with.

One form was isolated from spores exuded by a singly occurring pycnidium on spruce from Berteig in Luster parish April 1948. This pycnidium had almost exclusively 4-celled spores, closely resembling the 4-celled individuals amongst the *S. strobilinus* conidia (Fig. 6 g). By germination they developed a mycelium which differed from that of *S. strobilinus* by its somewhat darker colour and slightly faster growth. The identity of this fungus with *S. strobilinus* may be doubtful. Material is too scanty for giving conclusive information in this respect, however.

The other form, occurring as pycnidia on one of the original Senneset samples (besides typical specimens) was distinguished by its distinctly pointed spore extremities (resembling those of *Darluca!)*. Dr. PETRAK identified this fungus as *Sirococcus strobilinus,* and the pycnidia could hardly if at all be distinguished from those of that species. In culture, however, it behaved entirely different from the last-named one. In fact, it developed an appressed, glabrous mat, almost without aerial hyphae, but with distinct zones forming concentrical waves 7—8 cm. in width on the mat surface. At first colourless, later more or less black. Daily radial increment 1.1—1.4 mm. Growth rate about three times as great when a sterilized spruce twig has been partly embedded in the slant. Pycnidia then abundant. Pycnospores exclusively two-celled, 11.8—17.8 × 2.5—3 μ, shape more variable in culture than in the original material (Fig. 6 h). I should like to propose the provisional name *Sirococcus strobilinus* var. *acutisporus* for this fungus.

17. Brunchorstia pinea (KARST.) HOEHN. (Syn. *B. destruens* ERIKSS.)

On *Picea abies:*

Gaular parish, Døskeland saw-mill	31.31.1948 (3:6)
Jondal „ , Hallaråkershagan	May 1948 (1:2)
Voss „ , Bjørke	March—April 1948 (1:3)

Isolated from the bark of *Picea abies* from one sample of each of the three collections noted above.

Although the ontogenetical connection between *Brunchorstia pinea* and *Crumenula abietina* LAGERB. *(Scleroderris abietina* (LAGERB.) GREMMEN 1953) must be considered definitely prooved and seems now to be generally accepted, I mention the fungus here under the first name because (with one, somewhat doubtful exception) only pycnidia have been met with during my investigation.

The fungus has been encountered by me in relatively few cases. It has neither been observed on nor isolated from samples showing only initial symptoms of the disease. As a possible causal agency obviously no importance can be attached to it. Its culture characteristics are well known (cmp. f. i. VAN VLOTEN & GREMMEN 1953) for which reason I do not mention them here. Within my material, pycnospores have measured 30—47 (—51) × 3—4 μ (cmp. ETTLINGER 1945).

18. Hendersonia abietis ROUM. et FAUTR.

On *Picea abies:*

Luster parish, Berteig	April 1948 (2:8)

Det. Dr. PETRAK.

Spores (Fig. 7 a) 12—16.2 × 5—6 μ (rarely up to 18 × 7 μ) against ALLESCHER (1903): 12 × 4 μ.

Cultures on malt agar glabrous, almost without air mycelium, colourless, daily radial increment at room temp. 2—2.3 mm. Pycnidia having extremely delicate walls develop in the presence of sterilized spruce twigs in the slant.

19. Camarosporium strobilinum BONN.

Gaular parish, Senneset school	31.3.1948 (1:2)
Førde „ , Førde priest-yard forest	21.2.1948 (1:1)
Jondal „ , Hallaråkershagan	April—May 1948 (1:2)

The Senneset material examined and identification confirmed by Dr. PETRAK.

The conidia (Fig. 7 b) are very much like the *Camarosporium* conidia attributed to *Cucurbitaria piceae* BORTHW. but our fungus has

neither been accompanied by perithecia nor by the scolecosporous pycnidia described in that species. As measuring 24—33×16—20 μ my spores are somewhat intermediate between those attributed to *C. piceae* (25—30×15—17 μ acc. to FERDINANDSEN & JØRGENSEN 1938) and those of *C. strobilinum* (Acc. to ALLESCHER (1903): 27—36×21—24 μ), particularly concerning their width. Mycelium on malt agar woolly-barby, margin even and 2—3 mm. high, colour light yellow-grey (OSTW. ec2), daily radial increment at room temp. 0.9—1.0 mm.

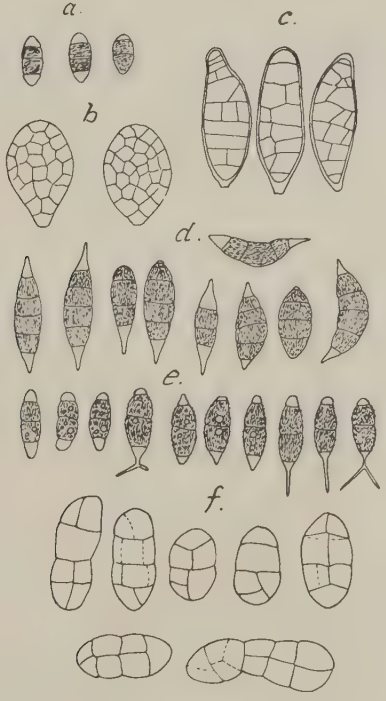

Fig. 7. a. *Hendersonia abietis* ROUM et FAUTR. Conidia from culture pycnidia.
b. *Camarosporium strobilinum* BONN. From original material.
c. *Myxocyclus cenangioides* (ELL. et ROTH) PETR. From pycnidia on Douglas fir decoction agar.
d. *Coryneum juniperi* ALLESCHER (?) from malt agar culture.
e. *Pestalotia sabinae* FAUTR. (?). Three left conidia from original material on Douglas fir; note the non-verruculose walls! Rest of conidia from Douglas fir decoction agar.
f. *Sirodesmium ellipsoideum* NEERGAARD n. sp. ad int. from malt agar culture.
(All figures of conidia ×500).

20. Myxocyclus cenangioides (Ell. & Roth) Petr. (Syn. *Camarosporium abietis* Wils. & And.)

On *Abies concolor*	: Fana parish,	Kismul	26.5.1948
„ *A. nobilis*	: Os „ ,	Ekhaug	24.1.1949
„ *A. nordmanniana:*	„ „ ,	„	„
„ *A. grandis*	: Fana „ ,	Stend	19.1.1949

The material from *A. concolor* was identified by I. Jørstad.

Spores of *Myxocyclus cenangioides* germinate extremely slowly on malt agar. When the mycelia have attained macroscopical dimensions, growth may for some days be moderately rapid (daily radial increment max. 1.4 mm.), the low, dark-coloured mat very unevenly outlined owing to self-staling which quickly prevents further growth. Staling less pronounced on a douglas fir decoction agar on which pycnidia with mature spores (Fig. 7 c) developed.

21. Robakia arctica Petr. n. g. et n. sp.

On *Picea abies:*

Fjaler parish, Svinevik 1.4.1948

This species was discovered by Dr. Petrak on a top sample sent him for examination and has been given a very full description by him (Petrak 1952). I have not succeeded in recovering the fungus on any of the samples otherwise examined and, consequently, I am unable to yield any informations about its culture characteristics.

Melanconiales

22. Coryneum juniperi Allescher (?)

Isolated from the bark of *Picea abies:*

Gaular parish, Senneset school 3.4.1948 (1:4)

Of his *Coryneum juniperi* Allescher (1903) notes: "Spores with 5 septae, the 4 central cells of almost even size, dark-brown, terminal cells hyaline, conical. Spores at first n o t, later f a i n t l y constricted at the septae, 25—30 × 6—9 μ." The spores of our fungus (Fig. 7 d) agree fairly well with that description, their dimensions being 20—30 × 6—10 μ, the short terminal spines not included. Cultures on malt agar: Mat low, covered by a finely and irregularly curled air mycelium, margin white and finely fringed, otherwise blueish olive-grey (near Ostw. gc17). Daily radial increment at room temp. 1.4 mm. Acervuli develop after a few weeks.

23. Pestalotia sabinae Fautr. (?)

On *Pseudotsuga taxifolia* f. *viridis:*

Førde parish, Førde 1.5.1948

Among the *Pestalotia* species described from conifers *P. sabinae* Fautr. is certainly the species with which our fungus has most in common. In fact, Allescher's description of *P. sabinae* agrees very well with my observations on the Førde fungus. *P. sabinae:* spores 20—22×7—8 μ, our fungus: 16—24×6.5—7.5 μ. Important seems the following characteristic which both have in common: The only existing terminal projection divided into two or three stiffly diverging branches (cfr. Allescher 1903). Certainly, within the original material of our fungus the spores were slightly smaller (max. 20 μ ?) and entirely without any projections. However, in acervuli developed in culture on douglas fir decoction agar a certain proportion among the spores carried the projections described above (Fig. 7 e).

24. Cryptosporiopsis diversispora Robak

Isolated from *Picea abies:*

Os parish, Ekhaug 14.4.1948 (1:3)

Isolated from *Abies grandis:*

Fana parish, Stend 19.1.1949 (2:2)

25. Cryptosporiopsis balsameae Robak

Isolated from *Abies balsamea:*

Os parish, Ekhaug 24.1.1949 (1:3)

Isolated from *Abies grandis:*

Fana parish, Stend 19.1.1949 (1:2)

These two fungi have been comprehensively dealt with by the author in earlier publications (Robak 1949 and 1950), for the last-named one also its *Pezicula* stage.

Hyphomycetales

26. Tubercularia vulgaris Tode

On *Picea abies:*

Fjaler parish, Dale 31.3.1948 (5:20)
Luster „ , Berteig Apr.1948 (1:8)
„ „ , Sørheim 21.2.1948 (1:2)
Eid in Romsdal, Torviken 17.6.1948 (1:3)
Surnadal par., Heggset 10.6.1948 (1:22)

Although no doubt exists that *Tubercularia vulgaris* is the conidial stage of *Nectria cinnabarina* (TODE) FR., I mention the fungus under the first name because I have never met with its perithecia or perithecial stromata on any of the samples examined.

That the fungus has not been isolated from any of the spruce tops on which it has fructified, is certainly due to the fact that inoculi have always been taken from the transitional zone between dead and healthy tissue and that the sporodochia of *T. vulgaris* have never been localized to areas neighbouring that zone. The fungus is otherwise easily cultivated and grows vigorously on plain malt agar. Its cultural characteristics are already well known (see f. i. JØRGENSEN 1952).

27. Fusarium sp.

Isolated from *Picea abies* bark:

Fjaler parish, Dale	31.3.1948 (1:20)
Luster „ , Berteig	Apr.1948 (3:8)

This *Fusarium* which I have not been able to identify with any certainty (although it may belong to the *F. avenaceum* (FR.) complex which is found on a great number of varying substrata) has been characterized by 4—7-celled conidia, 24—52×2.9—3.7μ, only faintly curved and with no distinct elbow on the basal cell. Colour in masses: pale yellow-orange. Cultures on malt agar: Air mycelium vigorous, rose-coloured with local tinges of faint orange, woolly-cottony. Colour quickly lost by repeated transplantation. On oat-meal agar: Mat at first glabrous, strongly carmoisin to wine-red. After one week a loose, cottony, low, faintly creamy-orange air mycelium forms which gradually turns wine-red, texture not dense enough to cover the colour of the substrate mycelium. Not till after 2—3 months a new, dense, vigorous, high, dirty-white, cottony air mycelium develops and covers the red colour entirely. Abundant spore formation after ab. 2 weeks. Daily radial increment at 18—20° C. 3.5 mm. On bread: vigorous, almost *Mucor*-like, grey-white air mycelium showing extended, brown-yellow areas. Medium strongly carmin to wine red. Spores and what is like numerous sterile stromata formed after some weeks.

28. Sirodesmium ellipsoideum NEERGAARD n. sp. ad int.

On *Picea abies:*

Gaular parish, Senneset shool	3.4.1948
Kyrkjebø „ , Osland in Bjordal	May 1948

The excellent student of *Alternaria, Stemphylium* and morphologically related genera Dr. PAUL NEERGAARD, Copenhagen, has proposed to place the Senneset fungus within the genus *Sirodesmium* DE NOT., preliminarily as a new species. The fungus forms its spores in chains, in basipetal succession (contrary to *Alternaria)*. The chains radiate from a center, thus forming a dense, semiglobular mass of max. 2 mm. width and of a jet-black colour. Mature spores (Fig. 7 f) are dark brown, 20—33×12—14 μ (when still longer apparently formed by incomplete separation of two individuals). Cultures: On malt agar mat fur-like to woolly, few mm. high, of a light-greyolive colour (Ostw. ec2 to ge2). Daily radial increment at room temp. 1.3—1.9 mm. Spores form in fresh isolates, fertility then quickly declining.

CONCLUSIONS

In this paper I have mentioned and, partly, described the fungi which could with some degree of certainty be identified, amongst the total of species met with during my work regarding the diseases mentioned in the introduction.

A greater number, however, could not be identified at all, although in some cases suggestions could be made as to the genera in which they had to be placed. Both sphaeriaceous and shaeropsidaceous fungi as well as *Hyphomycetes* and sterile mycelia have been represented within this incompletely known material of fungi, the greater number of them amongst the species encountered in cultures made from the bark tissue. This fact indicates that the dead bark of conifers is invaded by a far greater number of fungi than those known to fructify on the different species in question. The repeated isolations of *Phomopsis pseudotsugae* Wils. from Norway spruce yield a striking example of a fungus the host list of which includes most probably, a far greater number of tree species than might be concluded merely from the occurrence of its fructifications in nature.

ACKNOWLEDGMENTS

Specialists to whom I am much indebted for their kind and valuable help are Dr. F. PETRAK, Vienna, Dr. G. G. HAHN, New Haven, Conn., Dr. L. E. WEHMEYER, Ann Arbor, Mich., Dr. P. NEERGAARD, Copenhagen, and Dr. I. JØRSTAD, Oslo.

LITERATURE

1901. **Allescher, H.:** Fungi imperfecti. I. In Rabenhorst's Kryptogamenflora V. 1, Abt. VI. Leipzig 1901.

1903. **Allescher, H.:** Fungi imperfecti. II. Ibid. V. 1, Abt. VII. Leipzig 1903.

1945. **Ettlinger, L.:** Über die Gattung Crumenula sensu Rehm etc. Dissertation. Bern 1945.

1938. **Ferdinandsen, C. & Jørgensen, C. A.:** Skovtræernes Sygdomme. I. Copenhagen 1938.

1952. **Gremmen, J.:** A preliminary study on the culture of Discomycetes, especially the perfect stage. — Antonie v. Leeuwenhoek V. 18: 153—164, 1952.

1935. **Grove, W. B.:** British Stem- and Leaf-Fungi. Spaeropsidales I. Cambridge 1935.

1930. **Hahn, G. G.:** Life-history studies of the species of Phomopsis occurring on Conifers. I. — Trans. Brit. Mycol. Soc. 15: 32—93, 1930.

1890. **Hartig, R.:** Eine Krankheit der Fichtentriebe. — Zeitschr. f. Forst-u. Jagdwesen 22: 667—670, 1890.

1952. **Jørgensen, H. A.:** Studies on Nectria cinnabarina. Hosts and variations. — Contrib. No. 35. Dept. Plant Pathology of the Royal Veterinary and Agricult. Coll., Copenhagen. Den kgl. Veterinær- og Landbohøjskoles Årsskrift 1952: 57—120, 1952.

1945. **Jørstad, I.:** Parasittsoppene på kultur- og nyttevekster i Norge, I. Tillegg til Meld. fra Landbruksdirektøren, Oslo 1948.

1950. **Kujala, V.:** Über die Kleinpilze der Koniferen in Finnland. — Commun. Instit. Forestali Fenniae V. 38.4.1950.

1913. **Lagerberg, T.:** Granens topptorka. — Meddel. Statens Skogsförs.anst. 10: 9—44, 1913.

1927. **Lagerberg, T., Lundberg, G. & Melin, E.:** Biological and Practical Researches into Blueing in Pine and Spruce. I. — Sv. Skogsvårdsf. Tidskr. 1927: 145—272, 1927.

1936. **Nazarowa, E. S.:** Pine disease caused by Sclerophoma pithyophila v. H. — Bull. Acad. Sci. USSR Sèr. biol. 6: 1191—1208, 1936.

1948. **Nobles, M. K.:** Studies in forest pathology. VI. Identification of cultures of wood-rotting fungi. — Canad. Journ. Res. C. V. 26: 281—431, 1948.

1930. **Ostwald, W.:** Die kleine Farbmesstafel, Edit. A. Muster-Schmidt, Göttingen 1930.

1952. **Petrak, F.:** Zwei neue Gattungen der Parasphaeropsidéen. — Sydowia VI: 372—377, 1952.

1896. **Rehm, H.:** Hysteriaceen und Discomyceten. In Rabenhorst's Kryptogamenflora V. 1, Abt. III. Leipzig 1896.

1932. **Robak, H.:** Investigations regarding fungi in Norwegian groundwood pulp and fungal infection at wood-pulp mills. — Nyt Mag. f. Natvsk. 71: 185—330, 1932.

1942. **Robak, H.:** Cultural studies in some Norwegian wood-destroying fungi. — Meddel. Vestl. Forstl. Fors.st. No. 25, 1942.

1949. — : A heterosporous Diploidia sp. Isolated from necrotic bark tissue of Conifers in Western Norway. — Sv. Bot. Tidskr. 43: 534—539, 1949.

1950. — : On the identity of Diplodia diversispora Robak n. sp. ad int. and of a related fungus likewise isolated from dead coniferous bark tissue. — Ibid 44: 465—472, 1950.

1951. — : Noen iakttakelser til belysning av forholdet mellom klimatiske skader og soppangrep på nåletrær. — Meddel. Vestl. Forstl. Fors.st. No. 27, 1951.

1952 a. — : Dothichiza pithyophila (Cda.) Petr., the pycnidial stage of a mycelium of the type Pullularia pullulans (De B.) Berkhout. — Sydowia VI: 361—362, 1952.

1952 b. — : Phomopsis pseudotsugae Wilson = Discula pinicola (Naumov) Petr. as a saprophyte on coniferous woods. — Ibid. VI: 378—382, 1952.

1953. **Van Vloten, H. & Gremmen, J.:** Studies in the Discomycete genera Crumenula de Not and Cenangium Fr. — Acta Botan. Neerlandica 2: 226—246, 1953.

1933. **Wehmeyer, L. E.:** The genus Diaporthe and its segregates. — Ann Arbor, Mich. 1952.

1887. **Winter, G.:** Gymnoascacéen und Pyrenomyceten. In Rabenhorst's Kryptogamenflora V. 1, Abt. II. Leipzig 1887.

Bergen, February 1956.

CAPILLIPES CAVORUM G. NOV., SP. NOV., A NEW TERRICOLOUS INOPERCULATE DISCOMYCETE FROM SWEDISH LAPPLAND

By ROLF SANTESSON

In 1945 I collected in Torne Lappmark a small Discomycete with a remarkable appearance and a characteristic anatomy of its fruit bodies. For many years I have now sought for it in the literature but in vain. Apparently it represents a new genus.

The fungus was found on plant débris in the entrance of a small rodent's cave, most probably a lemming's, *Lemmus lemmus*. This may seem to be a strange habitat for a plant. However, on such places the lichen *Coniocybe furfuracea* is not very rare. The locality is situated in Abisko National Park in the subalpine *Betula pubescens (B. tortuosa)* forest between Abisko Tourist Station and the southern shore of the lake Torne Träsk, at an altitude of somewhat more than 350 m.

Capillipes nov. gen.

Ascomata stipitata, ± ceracea, stipite longo, tenui. Excipulum cellulis prismaticis vel subglobosis formatum. Hymenium valde convexum, iodo non mutatum. Asci cylindrici. Sporae ellipsoideae, continuae, incoloratae. Paraphyses simplices apice subsphaeroidaliter incrassatae, verrucosae, ascos superantes. Planta saprophytica.

Species typica (et adhuc unica):

C. cavorum nov. spec.

Ascomata pusilla, gracilia. Pileus ± globosus, (0,2—) 0,3—0,4 (—0,65) mm diam., pallide griseo-fulvus (fere avellaneus). Stipes (8—) 11—18 mm longus, 0,05—0,08 (—0,12) mm crassus, parte apicali pallida, parte basali nigra. Excipulum tenue, parte externa solum leviter fulvescente, ceterum incoloratum. Hymenium 50—70 μ altum; apices paraphysium epithecium pallide fulvescens formantes; asci ut paraphyses non agglutinatae. Asci

octospori. Sporae monostichae, oblongo-ellipsoideae, 8—10×2—3 μ. Paraphyses basaliter 1,5—2 μ, apice incrassato 6—8 μ crassae, sat dense verrucosae.

Hab.: Suecia, Lapponia tornensis, Abisko, alt. circ. 350 m, in terra (plantis valde destructis) in introitu cavi animalis *(Lemmus lemmus?)*. 9.VIII.1945, leg. ROLF SANTESSON. (Holotypus in herb. Instit. Botan., Uppsala.)

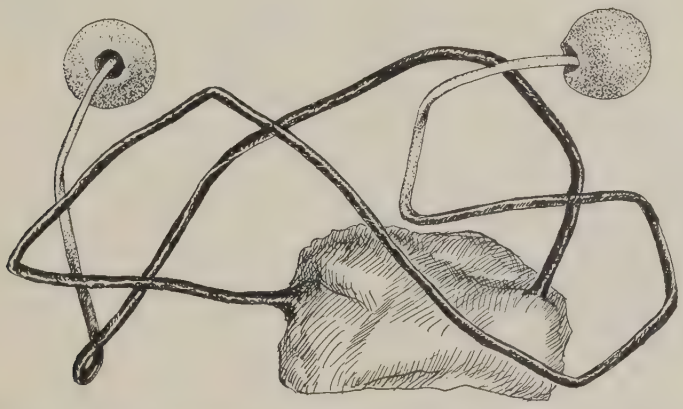

Fig. 1. *Capillipes cavorum*. Two specimens on a piece of plant débris. — About × 20. (Delin. M. INDUSS.)

Ascomata solitary or in loose groups, stipitate, with an almost globose pileus on a very long and slender stipe. Pileus (0.2—) 0.3—0.4 (wet 0.35—0.65) mm diam., ± waxy, pale greyish brown (RIDGWAY: Tawny-Olive to Dark Olive-Buff), sometimes as with a thin grey pruina. Stipe (8—) 11—18 mm long, 0.05—0.08 (wet 0.09—0.12) mm thick, abruptly and repeatedly bent in various directions, when wet ± cylindrical, when dry angularly and irregularly flattened, its upper (1/4—1/5) part grey to pale brownish, its lower part black, ± nitidous.

Stipe a bundle of hyphae forming a regular prosoplectenchymatous tissue, cells 15—30 μ long, 5—7 (—9) μ diam., their walls dark brown (except for the upper part of the stipe) and thick in the peripheral, thinner in the central part of the stipe.

Pileus exposing the hymenium at the surface of the globe which it forms. The stipe reachs the centre of this globe, its hyphae there bending outwards and downwards, ending in the excipular tissue. Excipulum thin (15—40 μ) formed by leptodermatous cells which are mainly prismatical and uncoloured, the outermost ones are ±

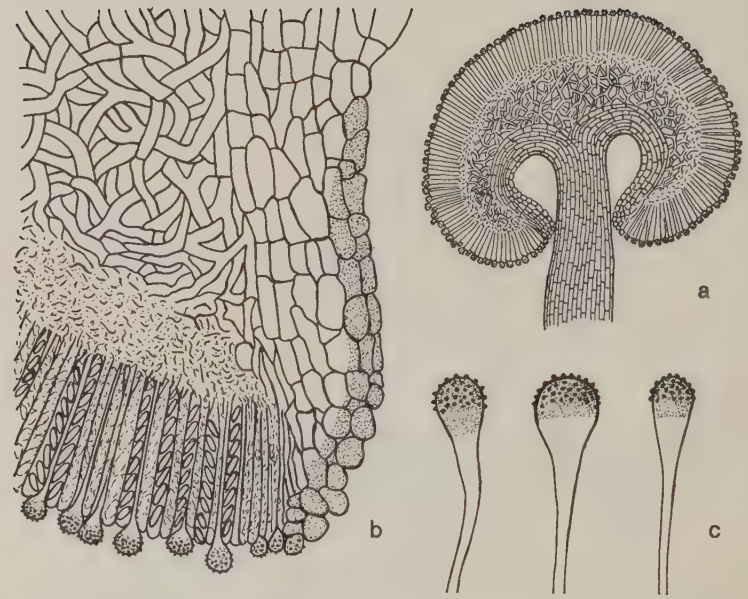

Fig. 2 *Capillipes cavorum*. a. Section through pileus and upper part of the stipe. — × 100. b. Detail of a, showing excipulum, marginal part of hymenium, etc. — × 450. c. Upper part of paraphyses. — × 1000.

globose and with pale brown walls; the margin of the excipulum not prominent. Between the hyphae of the top of the stipe and the hypothecium there is a loose medullary tissue, 40—120 μ thick, formed by leptodermatous, 2—4 μ thick hyphae. Hypothecium uncoloured, nubilous, 10—20 μ thick. Hymenium I—, 50—70 μ thick, its elements not glued together, with relatively few paraphyses the swollen ends of which form a distinct but not very dense, 7—10 μ thick, light brown epithecium. Asci 8-spored, cylindrical, 45—60 × 3.5—4.5 μ, their wall thickened at the apex but otherwise very thin; the apical apparatus totally I—; the spores obliquously arranged in one row. Spores (oblong-) ellipsoidal, continuous, uncoloured, smooth, 8—10 × 2—3 μ; many spores I+ pale bluish after a long time in iodine solution. Paraphyses simple, not septate, basally 1.5—2 μ thick, apically broadly clavate to almost globose, 6—8 μ thick, the uppermost part with a thick, pale brownish wall furnished with rather numerous small warts.

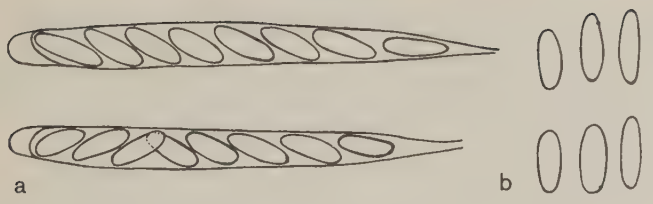

Fig. 3. *Capillipes cavorum*. a. Asci. b. Spores. — About ×1000.

Capillipes is an inoperculate Discomycete and a representative of the order *Helotiales* (sensu NANNFELDT 1932). On account of its thin and small asci the apical pore is usually difficult to observe — it is best seen after treatment with iodine.

From its stipitate ascomata *Capillipes* could be supposed to belong to the *Geoglossaceae*. Some features in the general appearance of the species of *Leotia* remind of *Capillipes*, but there exists certainly no close relationship between these genera. The difference is considerable in the excipulum, the paraphyses, the spores, the consistence of the ascomata, etc. Some ± small, stipitate fungi with a convex hymenium have been united in the genus *Cudoniella* which is usually referred to the *Geoglossaceae*. *Cudoniella* in current usage is a most heterogeneous group, cf. DURAND (1908 pp. 448, 462) and NANNFELDT (1932 p. 314). *C. marcida* (MÜLL. ex FR.) SACC. is a somewhat doubtful species; it is "rather *Cudonia confusa* than *Leotia lubrica*" according to NANNFELDT (1942 p. 44). Other species of *Cudoniella* must be referred to *Helotium*, *Ombrophila*, etc., thus not belonging to the *Geoglossaceae*. *C. brasiliensis* RIZZINI (RIZZINI 1952) has paraphyses with capitiform ends, like those of *Capillipes*. Its taxonomic position is difficult to state from the description. Perhaps it is a *Baeomyces* sp. It must be noted that a strongly convex hymenium is not a character of fundamental taxonomic importance, but is found in several different groups of the Discomycetes. The shape of the pileus of *Capillipes* does not prove relationship to the *Geoglossaceae*. As a matter of fact, no clear affinities could be established between *Capillipes* and any genus of this family.

According to NANNFELDT (1932) the family *Dermateaceae* (incl. *Mollisiaceae)* is characterized i. a. by its excipulum which in its main part has a "textura globosa". The members of this family have never a stipe with a "textura oblita" or "textura porrecta". The excipulum of *Capillipes* has in part a "textura globosa" (mainly "textura pris-

matica") but has a very well developed stipe with a "textura porrecta".

In the family *Hyaloscyphaceae* the apothecia are often distinctly stipitate, the excipulum with a "textura prismatica" is usually furnished with characteristic hairs, the asci are usually ± clavate and with a positive iodine reaction. *Capillipes* has no hairs, its asci are cylindrical and I —. I know no representative of the *Hyaloscyphaceae* with a strongly convex hymenium, and none with a stipe comparable with that of *Capillipes*.

The family *Helotiaceae,* as delimited by NANNFELDT, has an excipulum with a "textura intricata" or/and "textura oblita". Thus the structure of the excipulum of *Capillipes* is clearly differing. In the *Helotiaceae* there are many species with apothecia having a long stipe and also with convex hymenium. However, none of the species studied by me, from specimens or descriptions, showed any characteristics revealing close affinity of *Capillipes*.

The most remarkable character of *Capillipes* is the verrucose, head-like ends of its paraphyses. This type of paraphyses seem to be extremely rare in the whole order *Helotiales*.

In spite of the comprehensive and careful studies on the taxonomy of *Helotiales* performed by NANNFELDT there are still a great number of imperfectly known members. Future studies may probably reveal the exsistence of fungi related to *Capillipes,* making it possibly to give this genus a correct place within the families of *Helotiales*. Now I shall not try to force it into any of the families recognized.

Capillipes cavorum is known only from the type collection. Most probably the fungus is not so rare as could be supposed by our present knowledge. The reason why it has not been found previously, and now only once, certainly lies in its inconspicuousness and its rather peculiar habitat ecology. If the small rodent's caves in alpine — and perhaps other — regions are carefully studied it will perhaps be found in many places.

ACKNOWLEDGMENTS

I am very much indebted to Prof. J. A. NANNFELDT for valuable advise during my studies of this fungus, and to Docent HARRY SMITH for his kind help at the preparation of the manuscript.

LITERATURE CITED.

Durand, E. J. (1908): The Geoglossaceae of North America. — Ann. Myc. 6: 387—477.

Nannfeldt, J. A. (1932): Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten. — Nov. Act. Reg. Soc. Sci. Ups. ser. 4, 8(2): 1—368.

— (1942): The Geoglossaceae of Sweden. — Ark. f. Bot. 30 A(4): 1—67.

Rizzini, C. T. (1952): On a new Brazilian Hemilichen. — Arq. Jard. Bot. Rio de Janeiro 12: 139—144.

Uppsala, January 1956.

A SHORT SURVEY OF DANISH NEMATOPHAGOUS FUNGI

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The first discovery of a fungus which captured, killed and consumed nematodes took place in 1888, when ZOPF recorded that *Arthrobotrys oligospora,* earlier described by FRESENIUS (1850) as a saprophytic species, was in fact also parasitic upon nematodes. Since then DRECHSLER, DUDDINGTON and others have described some 80 species and the morphological diversity amongst these fungi is now well established. There are two main groups, the endozoic, obligate parasites which only exist independently of the host in the form of spores, and the nematode-trapping fungi, existing as saprophytes in the absence of nematodes but stimulated by their presence to form traps for their capture. These traps, which are specialised branches of the mycelium, are of four main types; the adhesive network, the adhesive knob, the non-constricting ring, and the constricting ring, all of which have been fully described by various authors.

In Denmark, 19 species of nematophagous fungi were recorded during a brief survey carried out in 1952—54, which comprised mainly an investigation into the incidence of predacious species in soil. An analysis of the records from 130 collections of various kinds from widely distributed parts of the country is shown in Table 1.

One species, *Harposporium crassum,* was described for the first time (SHEPHERD 1955) and another, *Haptoglossa heterospora* DRECHSLER, was recorded for the first time in Europe. As far as the Danish mycoflora is concerned, all the species listed in Table 1, with the exception of *Arthrobotrys oligospora*, are almost certainly first records. O. ROSTRUP (1916, 1935) reported several species of *Arthro-*

TABLE 1.

Occurrence of predacious fungi in various substrata in Denmark
Analysis of records from 130 collections

Species	Leaf mould.	Rotting wood	Decayed plant remains	Moss	Soil	Misc.	Total
Acrostalagmus obovatus	—	—	—	1	—	—	1
Arthrobotrys conoides	—	—	—	—	2	—	2
A. cladodes var. *macroides*	—	—	—	2	1	—	3
A. dactyloides	—	—	—	1	1	—	2
A. musiformis	—	—	1	—	4	—	5
A. oligospora	2	—	1	1	35	—	39
A. robusta	2	—	1	—	2	—	5
Dactylaria brochopaga ...	1	—	—	—	—	—	1
D. psychrophila	—	—	—	1	1	—	2
D. thaumasia var. *longa*	—	—	—	—	7	—	7
Dactylella cionopaga	4	—	—	1	1	—	6
D. doedycoides	1	1	—	—	—	—	2
D. ellipsospora	—	1	—	—	—	—	1
Haptoglossa heterospora .	—	—	—	—	—	1	1
Harposporium anguillulae	3	—	—	—	1	—	4
H. crassum	—	—	—	—	—	1	1
H. lilliputanum	1	—	—	—	—	—	1
Nematoctonus tylosporus	1	—	—	—	—	—	1
Stylopage hadra	1	—	—	—	—	—	1
Total records	16	2	3	7	55	2	85
No. of collections	19	11	5	17	76	2	130

botrys, Dactylaria and *Monacrosporium* in Denmark, including the following:

Arthrobotrys oligospora FRES.
A. longispora PREUSS
A. superba CORDA
Dactylaria echinophila MASSAL.
D. acicularia ROSTRUP
Monacrosporium elegans OUD.
M. oxysporum SACC.

Of these, only *Arthrobotrys oligospora* FRES. corresponds definitely to any of the present records, although *A. longispora* PREUSS may perhaps be synonymous with *A. conoides* DREHSLER and *Monacro-*

sporium elegans OUD. with *Dactylella ellipsospora* (PREUSS) GROVE. *A. superba* CORDA is now known to be nematode-trapping but none of the others can with certainty be regarded as synonymous with any of the predacious species. O. ROSTRUP does not mention predacious activity in any other than *A. oligospora,* for which he refers to a publication by EMIL CHR. HANSEN (1890), where ZOPF'S description of *A. oligospora* is quoted. Some of ROSTRUP'S records are again listed by LIND (1913).

Whilst the primary aim of the survey was to establish as far as possible which species were to be found in the country, account was also taken of the type of location and the substratum from which collections were made. The results indicate that leafmould from rather damp situations was the richest source of predacious fungi. From nineteen collections, sixteen records were obtained comprising nine species. Beech litter, however, seemed rather less suitable than that from other deciduous trees, possibly on account of its much slower rate of decomposition. Soil gave a high yield, sixty-two records being obtained from seventy collections, although only ten different species occurred. Moss and rotting wood, which other workers have found to yield predacious fungi in abundance, were not very productive in this survey.

Considering the various locations from which collections were made, the reed-swamp association appeared to be a very favourable habitat, yielding both quantity and variety. Beechwood was less favourable, and boggy situations proved to be very unsatisfactory, eleven collections yielding only one record. The incidence of predacious fungi in soil had not been investigated until DUDDINGTON (1954) published an introductory survey from British agricultural soils. The outstanding point which emerged from a survey of Danish agricultural soils from widely distributed districts was the frequency of appearance of *Arthrobotrys oligospora* FRES. This fungus, apparently, is not noticeably affected by any variations of hydrogen ion concentration, organic matter content or soil structure, since it was found over almost the whole range of each of these factors. From the results obtained, which corroborate DUDDINGTON'S results in Britain, *Arthrobotrys oligospora* emerges as an important element in the soil mycoflora and can almost certainly be regarded as an endemic soil species.

The following is a description of the generic characteristics and specific details of those nematophagous fungi found in Denmark. Further investigations would undoubtedly yield many more species.

Acrostalagmus

Mycelium branched, septate, endozoic, giving rise to fertile branches emerging from the host. Whorls of flask-shaped phialides borne at intervals on the fertile branches, from which aseptate conidia are produced. *Hyphomycetes.*

Acrostalagmus obovatus Drechsler, Phytopathology 31, p. 784, 1941.

In moss *(Dicranella* sp.), Sorgenfri, Sept. 1952.

Mycelium 2 μ wide, fertile branches 50—400 μ long. Phialides 2—3 per whorl; conidia very small, 2 μ across, slightly egg-shaped.

Harposporium

Mycelium branched, septate, endozoic, giving off fertile hyphae emerging from the host, these bearing spherical or subspherical branches with short sterigmata, from which arcuate conidia are produced. *Hyphomycetes.*

Harposporium anguillulae Lohde, Tageblatt 47. Versamml. deutsch. Naturforscher u. Ärzte in Breslau, p. 203, 1874.

In rotting leaves *(Ulmus* and *Sambucus),* Sorgenfri, Slotsparken, Sept. 1952 and leafmould, Rungsted, Dec. 1952.

Very common parasite of nematodes. Conidia 13—17 μ around the arc. Chlamydospores produced on the endozoic mycelium.

Harposporium lilliputanum Dixon, Trans. Brit. mycol. Soc. 35, p. 146, 1952.

In leafmould (beech), Folehave, Dec. 1952.

Endozoic mycelium 2—3 μ wide. Fertile hyphae up to 80 μ long. Conidia very small, 4—8 μ long around the arc, 0.5—1 μ wide.

Harposporium crassum Shepherd, Trans. Brit. mycol. Soc. 38, p. 47, 1955.

In horse dung, Ågård, Oct. 1952.

Endozoic mycelium 5.5—6.5 μ wide, cells rather short and broad,

somewhat thickwalled. Fertile hyphae 50—150 μ long, 1.5—2.5 μ wide. Subspherical branches 2.5—4.5 μ in diameter, bearing conidia 18—22 μ long around the arc, 2—3 μ wide.

HAPTOGLOSSA

Haptoglossa heterospora DRECHSLER, J. Wash. Acad. Sci. 30, p. 246, 1940.

This fungus appeared in nematodes (*Ditylenchus dipsaci)* isolated from infected celeriac. It consisted of an oval-shaped thallus which broke up into spores, these being released through a papilla penetrating the cuticle of the nematode. On release, the spores were of a rather irregular shape, 5.0—6.5 μ wide. They then encysted, and on emerging from the cyst the empty membrane remained attached to the spore, which had now developed a tongue-shaped lobe. These infective bodies were 5—10 μ in width.

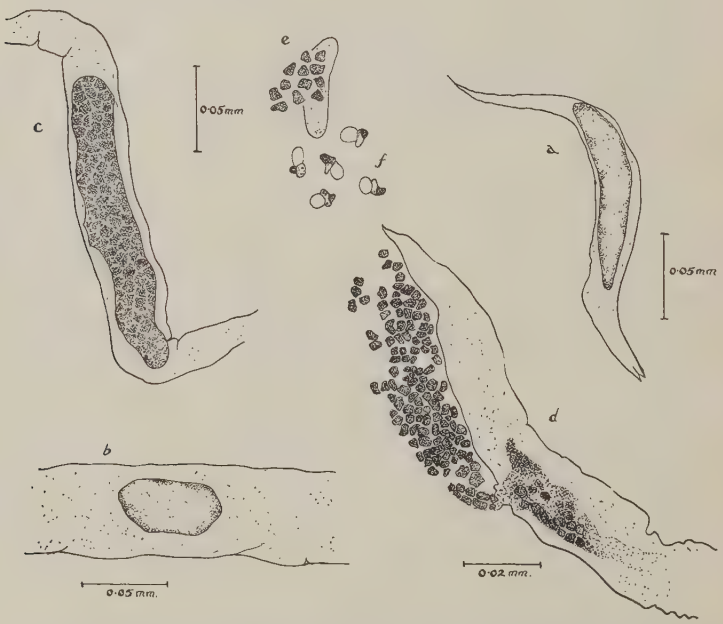

Fig. 1. *Haptoglossa heterospora* DRECHSLER.
a, b, eelworms containing a thallus; c, thallus, now a sporangium, showing cleavage lines; d, release of spores through a papilla penetrating the cuticle of a nematode; e, release of sporangiospores from a sporangium producing only a few spores; f, infective bodies with the cyst membrane still attached.

DRECHSLER, in his description of the species, refers to primary spores of two distinct size ranges, the lower range corresponding to that given above. None of the higher range appeared in this culture.

Oomycetes, probably *Lagenidiales.*

NEMATOCTONUS

Mycelium branched, septate, endozoic, producing long fertile branches extending outside the host, these branches having clamp connections at intervals and bearing single aseptate conidia, produced on short erect sterigmata. Generally regarded as an imperfect *basidiomycete.*

Nematoctonus tylosporus DRECHSLER, Phytopathology 31, p. 779, 1941.

In leafmould (beech), Sorgenfri, Sept. 1952.

Conidia club-shaped, 17—22 × 2.3—2.7 μ, with a small knob at the narrow, distal end.

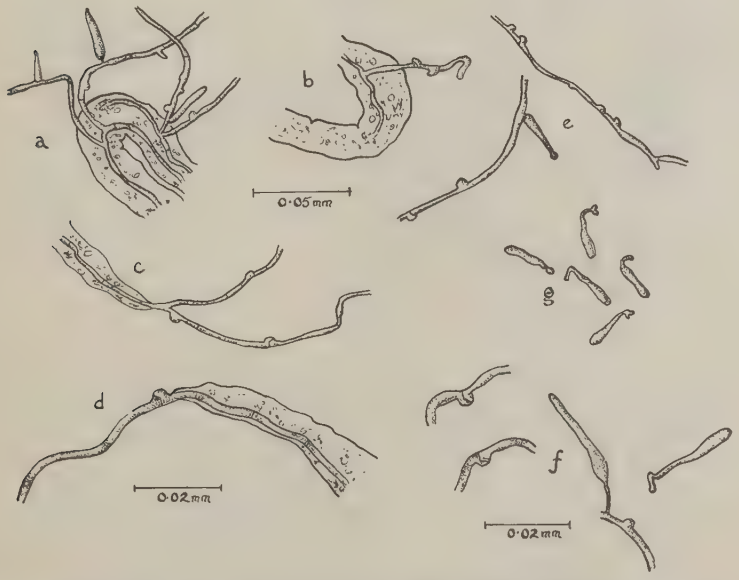

Fig. 2. *Nematoctonus tylosporus* DRECHSLER.
a-d, endozoic mycelium giving rise to aerial fertile branches; e, f, portions of fertile branches showing clamp connections and conidia; g, conidia.

ARTHROBOTRYS

Mycelium branched, septate. Conidia bicellular, hyaline, borne in heads or whorls on long aerial conidiophores. *Hyphomycetes, Moniliales, Moniliaceae, Didymosporae.*

Arthrobotrys conoides DRECHSLER, Mycologia 29, p. 476, 1937.

In soil, Næstved, Aug. 1952.

Trap mechanism adhesive networks. Conidia 19—33×8—15 μ, borne in compact heads.

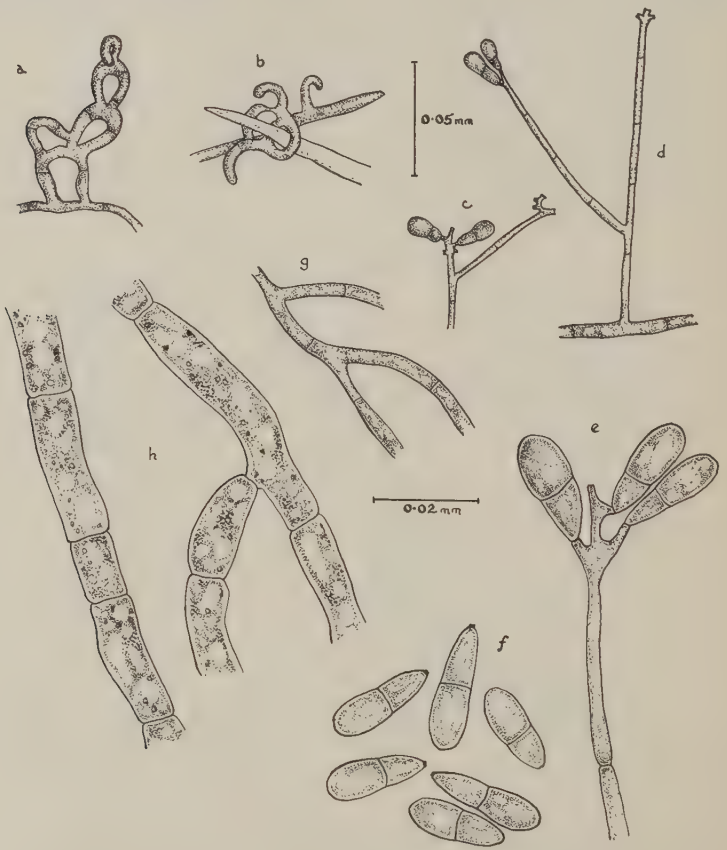

Fig. 3. *Arthrobotrys cladodes* var. *macroides* DRECHSLER.
a, b, networks; c, d, e, conidiophores; f, conidia; g, portion of ordinary mycelium; h, portions of enlarged storage hyphae.

Arthrobotrys cladodes var. **macroides** DRECHSLER, Mycologia 36, p. 144, 1944.

In moss, Sorgenfri, Sept. 1952 and Rungsted Dec. 1952.

Trap mechanism adhesive networks, often extensive. In pure culture, large storage hyphae, 8—12 μ wide, were observed. Conidia 15—22 × 6.5—8.5 μ. Tips of conidiophores often widened and lobed.

Arthrobotrys dactyloides DRECHSLER, Mycologia 29, p. 486, 1937.

In moss and soil, Sorgenfri, Sept. 1952 and Oct. 1953.

Trap mechanism constricting rings, mostly 20 μ in diameter. Conidia 43—51 × 8.5—9.6 μ, in loose heads containing up to 12 conidia. Terminal cell of trophic hyphae within the nematode swollen.

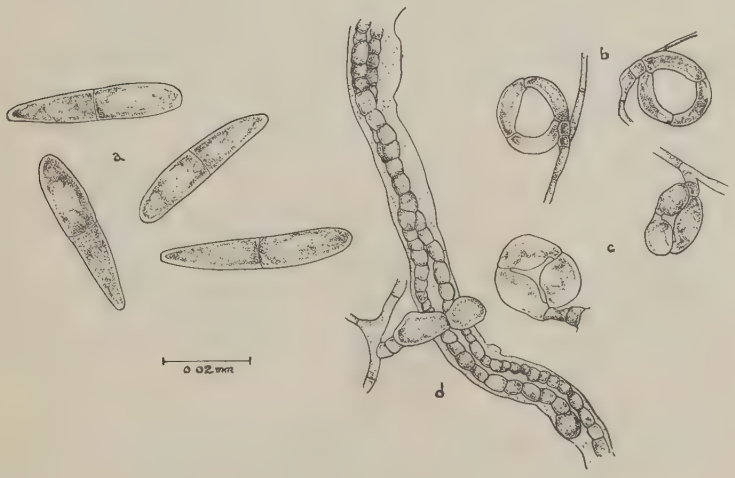

Fig. 4. *Arthrobotrys dactyloides* DRECHSLER.
a, conidia; b, constricting rings, showing the three-celled ring and the two-celled stalk; c, constricting rings as they appear after stimulation; d, a captured nematode with trophic hyphae, showing the enlarged ultimate cell of the branch.

Arthrobotrys musiformis DRECHSLER, Mycologia 29, p. 481, 1937.

In rotting corn stubble and soil, Sorgenfri, Sept. 1952.

Trap mechanism simple adhesive networks, characteristic for the species. Conidia 32—44 × 10—14 μ, in loose heads.

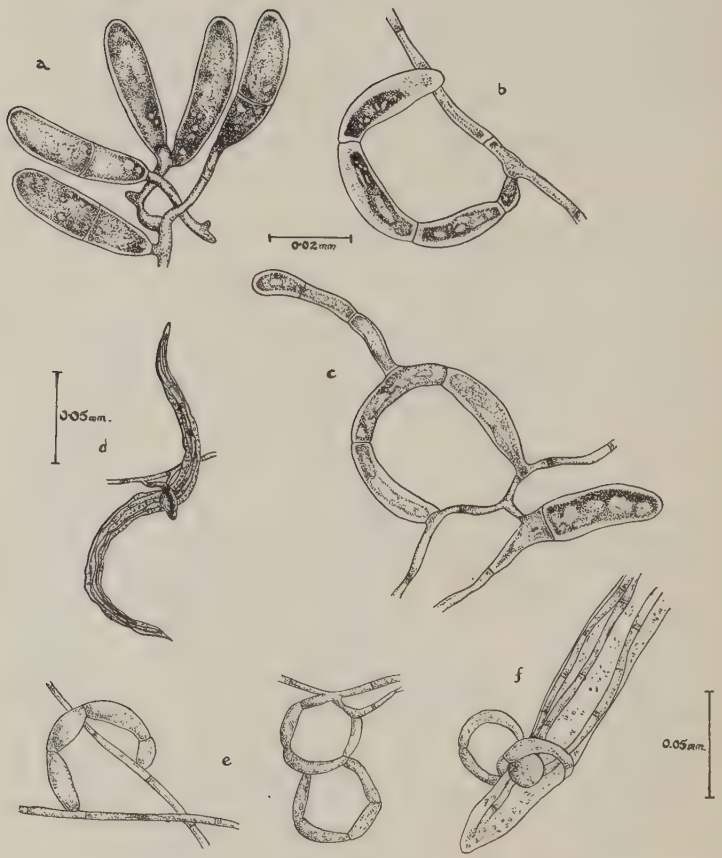

Fig. 5. *Arthrobotrys musiformis* DRECHSLER.
a, conidia; b, c, e, networks; d, f, captured nematodes showing the infection bulb and trophic hyphae.

Arthrobotrys oligospora FRESENIUS, Beiträge zur Mykologie, p. 18, 1850.

In soil from many parts of Denmark; in leafmould, decaying plant remains and moss.

Trap mechanism adhesive networks. Conidial ranges within those given by DRECHSLER, 22—32×12—20 μ (slightly lower in pure culture), varying from strain to strain. Conidia in heads, or later in whorls owing to proliferation.

Arthrobotrys robusta DUDDINGTON, Trans. Brit. mycol., Soc. 34, p. 598, 1951.

In leafmould, Sorgenfri, Slotsparken, Sept. 1952 and Rungsted, Dec. 1952; in decaying plant remains, Valby, March, 1953.

Trap mechanism adhesive networks. Conidia 18—24×8—12 μ, in heads.

DACTYLELLA

Mycelium branched, septate. Conidia hyaline, 3—6-celled, borne singly at the apex of aerial conidiophores. *Hyphomycetes, Moniliales, Moniliaceae, Phragmosporae.*

Dactylella cionopaga DRECHSLER, Mycologia 42, p. 30, 1950.

In leafmould (beech), Sorgenfri, Sept. 1952 and Folehave, Dec. 1952; in Sphagnum, Lyngby Mose, Sept. 1952.

Trap mechanism adhesive networks, characteristic for the species, the cells being short and constricted at the septa. Conidia spindle-shaped, 4—5-celled, 40—50×18—24 μ.

Dactylella doedycoides DRECHSLER, Mycologia 32, p. 454, 1940.

In leafmould (beech) and rotting wood, Sorgenfri, Sept. 1952.

Trap mechanism constricting rings, 20—22 μ across. Conidia top-shaped, 28—38×16.5—24 μ, 3-celled. Conidiophores slightly swollen at the tip.

Dactylella ellipsospora (PREUSS) GROVE, J. Bot. 34, p. 200, 1886.

In rotting wood, Sorgenfri, Sept. 1952.

Trap mechanism adhesive knobs, sometimes proliferating to form simple networks. Conidia spindle-shaped, 43—50×10—13 μ, mostly 3-celled.

DACTYLARIA

Mycelium branched, septate, Conidia hyaline, 3—7-celled, in heads on aerial conidiophores. *Hyphomycetes, Moniliales, Moniliaceae, Phragmosporae.*

Dactylaria brochopaga DRECHSLER, Mycologia 29, p. 517, 1937.

In leafmould, Rungsted, Dec. 1952.

Trap mechanism constricting rings, 25—30 μ in diameter. Conidia cylindrical, 4-celled, 33—41 × 6.6—8.1 μ.

Dactylaria psychrophila DRECHSLER, Mycologia 36, p. 161, 1944.

In moss and soil, Sorgenfri, Sept. 1952 and Aug. 1953.

Trap mechanism adhesive networks. Conidia ellipsoidal, 4—5-celled, 48—63 × 21—27 μ.

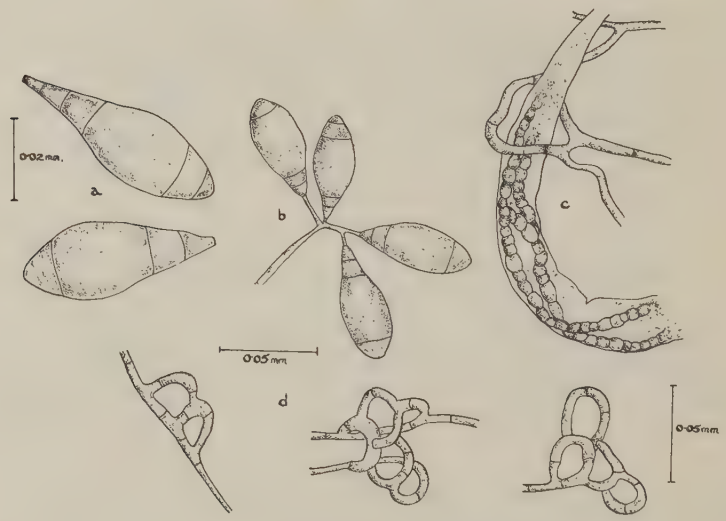

Fig. 6. *Dactylaria psychrophila* DRECHSLER.
a, b, conidia; c, a captured nematode showing trophic hyphae; d, networks.

Dactylaria thaumasia DRECHSLER var. **longa** DIXON var. nov. ined.

In soil, Horsens, Amager, Maarsø, Næstved, Lyngby, Aug. 1952.

Trap mechanism adhesive networks. Conidia 3—4-celled, 40.8—54.0 × 17.6—25.2 μ, central cell rather swollen. Conidia frequently germinating in situ.

Stylopage

Stylopage hadra Drechsler, Mycologia 27, p. 206, 1935.

In rotting leaves *(Ulmus* and *Sambucus)*, Sorgenfri, Slotsparken, Sept. 1952.

Mycelium branched, aseptate, hyphae 3.5—5.0 μ wide. Conidia aseptate, obovoid, 33—37 × 15—21 μ, containing rather granular cytoplasm and borne singly on aerial conidiophores. Nematodes captured by adhesion to the ordinary vegetative mycelium. *Zoopagaceae.*

ACKNOWLEDGMENTS

This work was carried out under the tenure of a Danish Government scholarship, awarded through The British Council. I am indebted to both these authorities and also to the Director and staff of Statens plantepatologiske Forsøg, Lyngby, for so kindly providing the necessary facilities. I should especially like to thank Dr. C. L. Duddington for his continual help and advice and Dr. P. Bovien, Mr. Knud Lindhardt and Dr. R. A. Dunning for their interest and criticism.

The material here set out has formed part of a thesis for the Ph. D. degree in the University of London (Shepherd, 1955).

REFERENCES

Dixon, S. M. (1952): Predacious fungi from rotten wood. — Trans. Brit. mycol. Soc. 35: 144—148.

Drechsler, C. (1935): A new species of conidial phycomycete preying on nematodes. — Mycologia 27: 206—215.

— (1937): Some Hyphomycetes that prey on free-living terricolous nematodes. — Mycologia 29: 447—552.

— (1940): Three fungi destructive to free-living terricolous nematodes. — J. Wash. Acad. Sci. 30: 240—254.

— (1940): Three new Hyphomycetes preying on free-living terricolous nematodes. — Mycologia 32: 448—470.

— (1941): Some Hyphomycetes parasitic on free-living terricolous nematodes. — Phytopathology 31: 773—802.

— (1944): Three Hyphomycetes that capture nematodes in adhesive networks. — Mycologia 36: 138—171.

— (1950): Several species of Dactylella and Dactylaria that capture free-living nematodes. — Mycologia 42: 1—79.

Duddington, C. L. (1951): Two new predacious Hyphomycetes. — Trans. Brit. mycol. Soc. 34: 598—603.

— (1954): Nematode-destroying fungi in agricultural soils. — Nature, Lond. 173; 500.

Fresenius, G. (1850): Beiträge zur Mykologie. Heft 1, p. 18.

Grove, W. B. (1886): New or noteworthy fungi. Part 3. — J. Bot., Lond. 34: 129—137, 197—206.

Hansen, E. C. (1890): Nye biologiske Undersøgelser hos Svampe. — Naturen og Mennesket 3: 129—132.

Lind, J. (1913): Danish fungi as represented in the herbarium of E. Rostrup. Copenhagen.

Lohde, G. (1874): Einige neue parasitische Pilze. — Tageblatt der 47. Versammlung deutscher Naturforscher u. Ärzte in Breslau: 203—206.

Rostrup, O. (1916): Bidrag til Danmarks Svampeflora. I. — Dansk bot. Arkiv 2, Nr. 5: 1—56.

— (1935): Bidrag til Danmarks Svampeflora. II. — Dansk bot. Arkiv 8, Nr. 8: 1—74.

Shepherd, A. M. (1955): Harposporium crassum sp. nov. — Trans. Brit. mycol. Soc. 38: 47—48.

— (1955): Some observations on the distribution and biology of fungi predacious on nematodes. — Thesis for degree of Ph. D. The Library of University of London.

Zopf, W. (1888): Zur Kenntnis der Infections-Krankheiten niederer Thiere und Pflanzen. — Nova Acta Leop. Carol. Deut. Acad. naturf. 52: 314—376.

Cambridge, January 1956.

DISTRIBUTION OF TRICHOLOMA GAMBOSUM (Fr.) Gill. AND BOLETUS GRANULATUS L. ex Fr. IN NORWAY

By JENS STORDAL

It is a well-known fact that several higher plants prefer calcareous soil, requiring at the same time particular climatic conditions, e. g. in respect of temperature. This is an important factor in the distribution of the plants (cp. Hultén 1950).

However, in the case of *Basidiomycetes* only very little is known in this matter. All the same, in several references it is suggested that *Tricholoma gambosum, Boletus granulatus,* and others are particularly fond of lime. This induced me to procure information about Norwegian finds to find out whether their distribution might verify these suppositions. The two species mentioned above are well known to most of us who are engaged in the study of fungi. The fact that they are delicious mushrooms as well, has contributed to the comparatively great attention that has been paid to them.

Everything that we know about the occurrence of these species in Norway before 1905 is collected in "Norges Hymenomyceter" (Blytt & Rostrup 1905). The information given here is based on collections and records by A. Blytt, E. Henning (1885), K. O. Björlykke, J. Olsen (dr. O. Sopp), and P. Hennings (1904). In the last twenty years especially much information has been gained from Eastern Norway by Chr. Fr. Böhme (1935—52, 1938). Also in Tröndelag the species are known, mentioned by O. A. Höeg (1942, 1943, 1946) in his reports.

With a view to procure further information I arranged for sending out inquiry forms to the people interested all over the country. In

this way answers have been submitted, stating new localities or verifying the non-existence of the species in certains parts of the country.

The existing herbarium material is available in the Botanic Museum of Oslo, being marked in the lists with (0).

1. Tricholoma gambosum (Fr.) Gill.

In Norway this species has only been found in spring-time, in May and June. The earliest date recorded, to my knowledge, is May 10, 1937. However, it is only in the latter half of May it can be said to appear in larger numbers. Then it usually keeps for a month's time. In July it is only seldom to be seen, but in the Oslo area it may sometimes keep till well into the middle of July (1938, 1951).

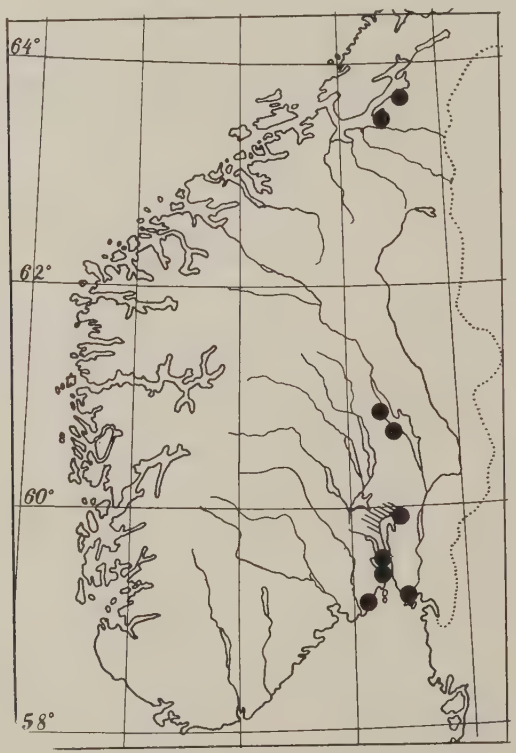

Fig. 1. The distribution of *Tricholoma gambosum* in Norway.

T. gambosum is recorded by Blytt (1905: 26) to grow in mixed spruce forest. This has also been verified by several others later. At Grav in Bærum it was found growing on a dry crest under pine trees. On Kråkeröy it occurred among grass both in thick brush-wood and on more open grass plains among frondage trees and scrubs.

Even Blytt stated that it occurred in several places in the lower areas near Oslo. A closer look at the particular localities will show that they can all be located in Oslo or on the western side of the town. Reports made by Böhme also verify these facts. S. G. Sundbye, who has been collecting mushrooms in Oslo for years, has been acquainted with a great many localities which have given very good yield.

On the western side of the Oslofjord *T. gambosum* has been recorded in the lowland down to Sandefjord. In Östfold the Fredrikstad area has been subjected to thorough investigations by W. Ramm. He states that *T. gambosum* in that area has only been found on Kråkeröy, where it was found growing in several localities. The ground in which it has been found, has always contained shell fragments.

In the interior of Eastern Norway it has so far been recorded up to Toten and Vardal. The interior of the country with its broad valleys stretching along Eastern Norway has not been subjected to closer investigations when larger fungi are concerned, and this is particularly the case with spring fungi. — In Tröndelag it reappears in the lower areas around the Trondheim fjord, but here it is very rare.

LOCALITIES

Östfold

Kråkeröy: Enhus, Holte, Strålsund and several places along the road between Enhus and the church 1951/55 (W. Ramm).

Oslo

Several places in Oslo (A. Blytt 1905: 26); Malmöya June 17, 1945 (J. Stordal); Hauketo (S. G. Sundbye); V. Aker June 2—July 17, 1950, May 18 — June 23, 1952; Ö. Sogn June 20 and 29, 1951; Ullevålsalléen June 29, 1951; Bergsalléen July 4, 13 and 16, 1951 (A. Bratsberg); Dronningberget on Bygdöy May 24, 1885 (K. O. Björlykke) (0); Gaustad, Frognerparken, V. Gravlund, Slottsparken,

Parkveien, Sköyen, Hofsbyen, Vækerö, Björnsletta, Valler-Gjettum and Fleskum (S. G. SUNDBYE).

Akershus

Many places around Oslo (A. BLYTT, CHR. FR. BÖHME). Skedsmo: Leirsund (I. A. LYSEBRAATE). Bærum: Grav (I. A. LYSEBRAATE, J. STOKKE); Kalvöya May 31, 1953 (F.-E. ECKBLAD) (0); V. Sandvika June 7, 1953 (F.-E. ECKBLAD) (0). Asker: Gullhella 1944 (H. RÖED).

Oppland

Toten (J. OLSEN). Vardal (J. OLSEN).

Buskerud

Hurum: Tofteholmen (J. EGELAND 1921).

Vestfold

Borre: Falkensten (J. OLSEN). Sandefjord and the surrounding country (The mushroom controller in Sandefjord).

Nord-Tröndelag

Stjördal: Vikan 1942 (O. A. HÖEG). Verdal: Svinhamarmarka near the sea-side (K. BRAARUD).

2. Boletus granulatus L. ex FR.

This is one of the earliest larger fungi in the autumn season. If the weather is not too dry, it appears in the latter half of July. The earliest find ever recorded is dr. O. SOPP'S material from Hovedöya near Oslo, July 13, 1882. It usually is at its height in August, but it may also keep till late in September, as for instance in Eidanger, Sept. 23, 1942. Last autumn a sample was even found as late as Oct. 11 on Bygdöy. However, the drought in the summer of 1955 caused several anomalies in the normal occurrences.

According to BLYTT (1905: 115) *B. granulatus* grows in spruce and pine forest. The same kind of localities is noted by RAMM on Kråkeröy, but here it also appears among grass in glades. In Tronfjell it was common in spruce forest and by road-sides (E. HENNING 1885: 67). Pines are always to be found near the localities, and most likely it lives in mycorrhiza with this kind of trees.

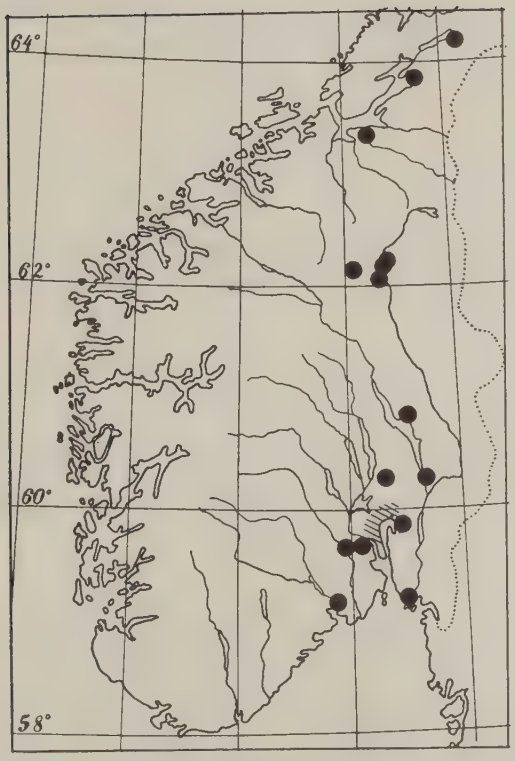

Fig. 2. The distribution of *Boletus granulatus* in Norway.

Blytt noted it as being frequent in Vestre Aker, Bærum and Asker, and P. Hennings (1904) found it "in vast quantities" June 1902, in Kongsskogen on Bygdöy (Oslo). Also later it has been ascertained that this fungus is not rare in Oslo and in the districts west of the town. It appears in Vestfold and Buskerud, and reappears in the south in the lime area near Brevik in Telemark.

In Östfold the same factors come into play as in the case of *T. gambosum*. It has only been seen on Kråkeröy in three localities where the soil was rich in shell fragments.

Up in the valleys of Eastern Norway a few more localities are known for this species than for *T. gambosum*. This is probably due to the fact that there are a greater number of botanists out practising at the time when *B. granulatus* fructifies.

Then this species, too, reappears in Tröndelag along the Trondheim fjord, but also this species is rare here.

LOCALITIES

Östfold

Kråkeröy: Fuglevik Aug. 11, 1951, July 24 and 29, 1953, July 17, Aug. 17 and 20, 1954, Aug. 22 and 30, 1955 (W. Ramm); Sandbukta July 16, 1953 (W. Ramm); Barkedalen Aug. 1953 (W.Ramm).

Oslo

Rustadsaga in Östmarka (H. Rui); Ulvöya 1942 (B. Bull); Gaustad-Sognsvatn Aug. 18, 1940 (Chr. Fr. Böhme); V. Aker Sept. 9, 1950 (A. Bratsberg); V. Aker (A. Blytt 1905: 115); Sogn Sept. 4, 1951 (A. Bratsberg); Bygdöy June 1902 (P. Hennings 1904: 17); Kongsskogen on Bygdöy Oct. 11, 1955 (I. A. Lysebraate) (0); Hovedöya July 13, 1882 (J. Olsen) (0).

Akershus

Eidsvoll: SW. of Eidsvoll st. Sept. 3, 1942 (Chr. Fr. Böhme); Bærum and Asker: Common in the lower areas (A. Blytt 1905: 115).

Hedmark

Hamar (J. Olsen); Alvdal: The crest E. of Alvdal st. Aug. 20, 1943 (Chr. Fr. Böhme); Around Tronfjell July 30, 1884 (E. Henning 1884: 67); Tynset: Around Tronfjell July 30, 1884 (E. Henning 1885: 67); Folldal: Enunda-Årlet (A. Blytt 1905: 115).

Oppland

Lunner: Roa, near the old road to Bergen (H. Rui).

Buskerud

Kongsberg: W. of the town Aug. 28, 1940 (Chr. Fr. Böhme).

Vestfold

Skoger (A. Blytt 1905: 115).

Telemark

E i d a n g e r: The areas around Heistad Sept. 9, 1942 (CHR. FR. BÖHME).

Sör-Tröndelag

S t r i n d a: W. of Lianvatn (O. A. HÖEG 1946: 22).

Nord-Tröndelag

V e r d a l: Vera, about 400 m above sea level (K. BRAARUD); S n å s a: Finsåsskogen Sept. 22, 1944 (O. A. HÖEG).

SUMMARY

Although we have not nearly complete knowledge of the distribution of *Tricholoma gambosum* and *Boletus granulatus* in Norway as yet, certain interesting tendencies seem to reveal themselves which might induce us to closer investigations. Apparently both species show a rather similar distribution, a fact that is reminiscent of several heat and lime loving phanerogamia, e. g. *Polygala amarella* (NORDHAGEN 1940: 426).

In the Oslo area, which must be said to be well investigated, they undoubtedly prefer the Silurian in Oslo and on the western side of the Oslofjord. East of the Oslofjord this calcareous rock is on the whole lacking. Here the localities are to be found near the fjord, an occasional occurrence of lime being left in the soil, e. g. in form of shell. An exception to this are finds from Rustadsaga in Östmarka.

On the western side of the Oslofjord they extend over Vestfold. *B. granulatus* also reappears in the numerous calcareous areas around Brevik.

Up in the country they follow our warm valleys in the interior of the east. The interesting plant mountains around Tronfjell seem to offer favourable conditions for *B. granulatus* at least (E. HENNING 1885), and here it gets high into the pine forest. — Then we again rediscover both species around the Trondheim fjord, but here they are rarer.

In Southern, Western and Northern Norway neither has been noted even though they have been searched for in several places both in outer and inner districts.

LITERATURE

Blytt, A. & Rostrup, E.: Norges Hymenomyceter. — Vidensk.-Selsk. Skrifter I. Math.-Naturv. Kl. No. 6. Christiania 1905.

Bøhme, Chr. Fr.: Våre Nyttevekster. Heggedal 1935/52.

— : Oslo Helseråds kontroll av torvfört sopp gjennom 6 år. — Nytt Mag. for Naturv. B. 78. Oslo 1938.

Ferdinandsen, C. & Winge, Ø.: Mykologisk Ekskursionsflora. 2. Udg. København 1943.

Henning, E.: Bidrag till svampfloran i Norges sydligare fjelltrakter. — Öfvs. Kongl. Vetensk.-Akad. Förh. Stockholm 1885.

Hennings, P.: Beitrag zur Pilzflora der Umgebung Christiania (Halbinsel Bygdö). — Nyt Mag. for Naturv. Christiania 1904.

Hultén, E.: Atlas över växternas utbredning i Norden. Stockholm 1950.

Høeg, O. A.: Det Kongelige Norske Videnskabers Selskab. Museet. Årsberetning. Trondheim 1942.

— : Notater om sopper i Tröndelag og Nordmöre. — Våre Nyttevekster. Heggedal 1943.

— : Norsk Botanisk Forening. Tröndelagsavdelingen. Årsmelding for 1944. — Blyttia. Oslo 1946.

Nordhagen, R.: Norsk Flora. Oslo 1940.

Ski, Norway, February 1956.

LACTARIUS GROENLANDICUS SP. NOV.

By FREDE TERKELSEN

Thanks to a grant from The Danish National Scientific Foundation in August-September, 1955, I was able to make a journey to West Greenland for the purpose of collecting *Macromycetes,* especially *Boletaceae* and *Agaricaceae,* in the regions north of the Arctic Circle which in that respect had so far been rather unexplored.

Of course, it was a revelation for me to make investigations of the fungus flora of areas which, practically speaking, were entirely virgin. I came across a large number of strange fungi, and many species from these regions will probably appear to be undescribed, especially species within the genera *Russula* and *Lactarius.*

The fungi of Greenland may in many cases be so closely related to well-known European and American species that it would be right to consider them just as varieties of these. But in other cases it is no doubt possible to find species of fungi which have never been described before. Such species may, of course, resemble some species hitherto known, but may nevertheless possess certain characteristics of their own which show that they are separate species, rather than varieties of other species. In my opinion, this applies to the species of the genus *Lactarius* which I am going to describe in the following. — As this fungus seems to have been found only in Greenland, I find it appropriate to name it: *Lactarius groenlandicus.*

Lactarius groenlandicus sp. nov.

F i n d s: Coll. No. 16 (F. T.), Hassells Fjeld, Söndre Strömfjord, 13/VIII, 1955. — Coll. No. 49 (F. T.), Godhavn, between the town and the arctic station, 17/VIII, 1955, (colour-photos were taken, see Fig. 1). — Also found on the heath between the arctic station and the Rödeelv stream, 19/VIII, 1955, 22/VIII, 1955, and 27/VIII, 1955.

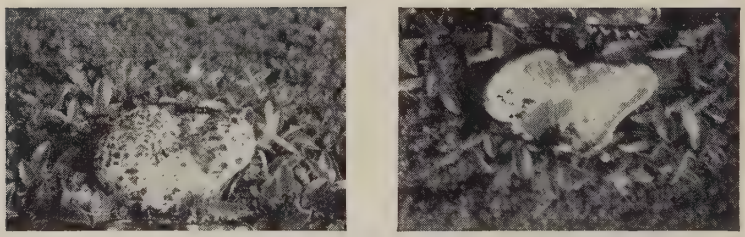

Fig. 1. *Lactarius groenlandicus* sp. n. — Photo. FREDE TERKELSEN.

Habitat: Always found in shrubs of willow *(Salix)* or near such shrubs.

Description: Cap: 7—11 cm broad, convex-expanded, often with oval outlines and then a little concave at the centre between two flat "saddles"; whitish, turning yellowish; slightly viscid; later dry and somewhat shining; smooth, but the incurved margin at first very shaggy. — Gills: rather narrow; moderately crowded; whitish, at last straw-coloured, stained rusty or brownish when cut or bruised. — Milk: white, unchangeable, copious, mild. — Stem: sometimes a little eccentric, 2—5 × 1—1.5 cm, whitish or yellowish, sometimes pitted with lemon-yellow spots, cylindrical or acuminate, hollow. — Flesh: white, firm, with a pleasant, sweetish smell of *Lactarius helvus* or curry, which gets stronger when dried.

Gregarious, often almost hidden by earth and foliage sticking to the viscid surface of the cap.

Spores: Ellipsoidic or subglobose, minutely echinulate or reticulate, (6.5—)7—8×5—5.5 μ. See Fig. 2.

Veil made up of hyaline fibrils, 3—4 μ broad; similar hyphae densely matted on surface of pileus, not gelatinous.

Cystidia on face of lamellae hardly protruding over mature basidia, about 30—50 × 6—7 μ.

DIAGNOSE LATINE

Pileus 7—11 cm latus, e convexo expansus, centro plus minusve concavo, albidus, dein lutescens, e viscido siccus, glaber, margine primitus inflexo et floccoso-barbato.

Lamellae subangustae, subconfertae, albidae, postremo stramineae, vulneratis ferrugineo-maculatis.

Lac album, invariabile, copiosum, mite.

Stipes 2—5 cm × 1—1.5 cm, interdum subexcentricus, albidus vel lutescens, saepe scrobiculis citrinis ornatus, cylindricus vel sursum attenuatus, cavus.

Caro alba, firma, odore subdulci fere *Coci nuciferae,* sicca *Lactarium helvum* vel "curry" redolente.

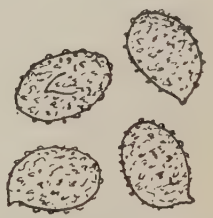

Fig. 2. Spores of *Lactarius groenlandicus* Del. F. H. MØLLER ×2000.

Sporae (6.5—)7—8 × 5—5.5 μ, ellipticae vel subglobosae, minute echinulatae vel minutissime et parce reticulatae.

Gregarius, in salicetis, saepe sub sabulone et foliis fere occultus.

Typus die 16' Augusti 1955 sub Salice ad sinum Sdr. Strømfjord Groenlandiae occidentalis sub numero F. T. 16 lectus, in Museo Botanico Hauniensi depositus.

This big and beautiful species, the most prominent *Lactarius* I saw in Greenland, should be classed in the section *Eulactarius,* subsection I. *Claricolorini* teste NEUHOFF. It does not seem to be found anywhere outside Greenland.

Lactarius groenlandicus is very much like *L. controversus* (PERS.) FR., but is not acrid and never zoned or stained with pink or red; it also differs in habitat. From *L. resimus* FR. it differs in the milk not turning sulphur-yellow. — The two American species which seem to be most closely related to *L. groenlandicus,* viz. *L. deceptivus* Peck and *L. subvellereus* Peck, are both characterized as "very acrid", and also their spore dimensions are different.

ACKNOWLEDGMENTS

In the preparation of this paper I have had valuable assistance from Mr. *F. H. Möller,* Senior Schoolmaster, who also has made the drawings of the spores, as well as from Mr. *Morten Lange,* Ph. D. Mr. *E. Brockmeyer* has been so kind as to go over the Latin diagnosis with a critical eye. I acknowledge with gratitude the help rendered me by these three gentlemen.

Danebod Folk-Highschool, Als, Denmark, April 1956.

TRICHOLOMA VERRUCIPES Fr. ELLER CLITOCYBE VERRUCIPES (Fr.) Maire FUNNEN I HÄLSINGBORGSTRAKTEN, SYDSVERIGE

Av HERVID VALLIN

Först några litteraturuppgifter om denna sällsynta, sporadiskt uppträdande, vita, vackra svamp.

E. Fries: Hymenomycetes Europaei, Upsaliae 1874. — S. 43. *Agaricus (Armillaria) verrucipes.* Upptäckt av v. Post 4.5.1870 nära Uppsala. „Odor farinae recentis, gratus; facile esculentus, ut plurimi fungi stricte vernales."

P. A. Karsten: Rysslands, Finlands och den skandinaviska halföns hattsvampar. I. Helsingfors 1879 (Bidr. t. kännedom af Finlands natur och folk 32). — S. 65: *Clitocybe puellula* Karst. Vit, hatten snövit, n. pucklig; foten brun- eller svartfjällig, lamellerna fastväxta. Kärrjord, dikeskanter, r, 6, 9. Finland (Mustiala). S. 20 upptages *Armillaria verrucipes,* lokal Uppsala.

L. Quélet: Flore Mycologique de la France et des pays limitrophes. Paris 1888. — S. 272—273: *Gyrophila verrucipes:* Chair ferme, blanche, très parfumé, odeur de farine et de fruits. -- Printemps. — En cercle dans les près ou bois sablonneux. Jura. Comestible.

G. Bresadola: Iconographia Mycologica. Vol. II. Mediolani 1927. Tab. 68. *Tricholoma verrucipes* (Fr.) Quél.; Quél., Fl. Myc., p. 272; Sacc., Fl. It. Crypt., Hym., p. 141. *Armillaria verrucipes* Fr. in Quél., Champs du Jura II, p. 304, t. 11, f. 1; Fr., Hym. Eur., p. 43; Sacc., Syll. V. p. 78. *Clitocybe puellula* Karst., Icon II, t. I, f. 31. .... odore pirino demum farinaceo, sapore grato; .....

Hab.: in herbidis juxta vias, saepe caespitosus, autumno, raro. Area distr.: Europa.

P. MAGNUS: Die Pilze (Fungi) von Tirol, Vorarlberg und Lichtenstein. Innsbruck 1905. — S. 296: *Tricholoma verrucipes* (Fr.) Bres. Italienisches Tirol: auf grasigen Plätzen an Wegrändern, meist rasig (Bres. II, p. 6.)

A. RICKEN: Die Blätterpilze (Agaricaceae) Deutschlands und der angrenzenden Länder, besonders Oesterreichs und der Schweiz. I. Leipzig 1915. — S. 330: *Tricholoma verrucipes* (Fr. 1873.*) — Bres.). Warzenfüssiger Ritterling .... Fleisch weiss, riecht birnen-schl. mehlartig. An grasigen Orten, neben Wegen, meist rasig 8—11. Selten.

P. KONRAD & A. MAUBLANC: Icones selectae Fungorum, VI. Paris 1924—1937. — S. 333: *Clitocybe verrucipes* (FRIES) R. MAIRE (1911). Syn.. *Armillaria verrucipes* FRIES ap. QUÉLET (1872); *Agaricus verrucipes* FRIES (1874); *Gyrophila verrucipes* QUÉLET (1886); *Tricholoma verrucipes* BRESADOLA (1892); *Agaricus puellula* KARSTEN (1876); *Clitocybe puellula* KARSTEN (1879).

Jura (QUÉLET), Grande-Chartreuse (R. MAIRE), Trentin (BRESADOLA), Finland (KARSTEN), etc.

E. BILLE HANSEN & F. H. MØLLER: *Clitocybe verrucipes* (FR.) MAIRE (Rufodet Tragthat) i Danmark. Friesia III (1944—48), Hefte 2 (1945). — S. 101: „Paa Botanisk Forenings Svampeexkursion til Lillerød d. 8.10.1944 fandtes (E. BILLE HANSEN) ved en Sti paa fugtig Bund i Allerød Mose mellem Græs *(Molinia coerulea)* nær Eg *(Quercus robur)* og Rødel *(Alnus glutinosa)* en Flok paa 5—6 Individer af en særpræget, hvid Tragthat, som senere bestemtes (F. H. MØLLER) til ovenstaaende Art."

E. INGELSTRÖM: Svampflora, Stockholm 1940. — S. 184: *Tr. verrucipes* FR., pärlmusseron ..... uppgiven för Uppsala- och Göteborgstrakten.

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5 km öster om centrum av Hälsingborgs stad ligger Vasatorps skog, i vilken finns ett tämligen öppet, gräsbevuxet område, en rest av en gammal fäladsmark med glest stående enbuskar och björkar och en sparsam vegetation av ljung *(Calluna vulgaris)* och odon *(Vaccinium uliginosum)*, blåtåtel *(Molinia coerulea)* m. fl. gräs och örter. I utkanten av fäladsmarken ligger en liten damm, kring vilken växer klibbal *(Alnus glutinosa)* med kuddar av *Leucobryum glaucum* och *Sphagnum* i sänkorna. 7—8 m väster om dammen fann jag på gräs-

*) i. e. „Hym. Eur.", 1874!

Fig. 1. *Tricholoma verrucipes* Fr.
Vasatorps skog, Hälsingborg, 28.9.1941.

mark med *Galium saxatile* och *Rhytiadelphus squarrosus* nära en enbuske den 28.9.1941 5 st. glänsande, vita, vackra pärlmusseroner, *Tricholoma verrucipes* Fr., med sina synnerligen karakteristiska svartbruna flockprickar (därav namnet „pärlmusseron") på foten, vilka på översta delen av foten, ½—1 cm under hatten, sitta tätare och därigenom göra en antydan om ett velum.

Enär pärlmusseronen utförligt beskrivits av Bille Hansen & F. H. Møller (1945), skall jag endast i korthet nämna några ord om den.

De 5 ex. stodo nära varandra, hattarna voro plana, mattglänsande, vita till mycket svagt ljusbruna med en karakteristisk något mörkare liten puckel i mitten. Hattarnas diametrar voro 6,5×6,5, 5,5×5,5, 4×3,5, 6×6 och 7×7 cm; fötterna voro resp. 7, 6, 5, 7.5, 7.5 cm långa samt något tjockare nedtill; alltså av betydligt mindre dimensioner än hos de i Allerøds mosse (Danmark) funna exemplaren. Jag återfann några individ av samma art på samma lokal den 1.11.1942, 13.9. 1946, 2.10. och 16.10.1949 samt 6.10 och 12.10.1950. Den 12.10.1950 var hattdiametern hos ett ex. 6,5×5,5 cm, foten 5 cm och upptill med en diam. av 7×5 mm. Ett annat ex. (det största) hade en hatt av

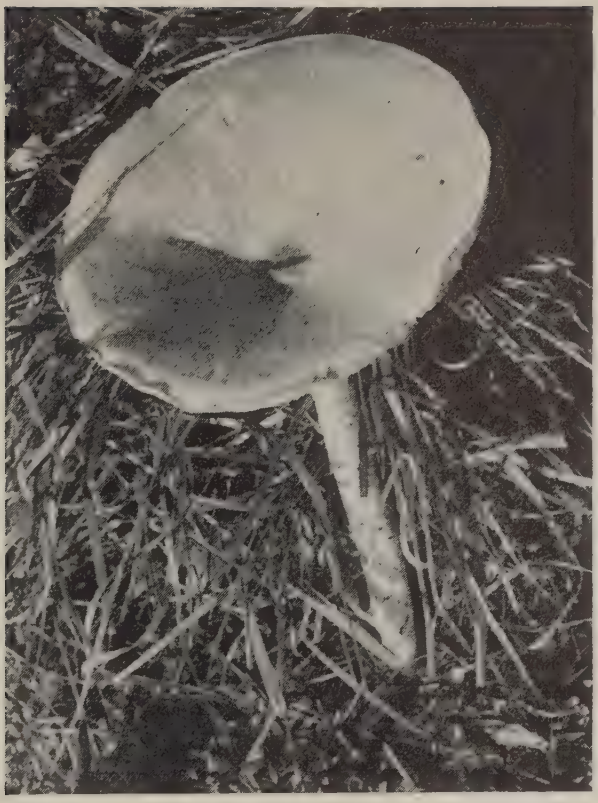


Fig. 2. *Tricholoma verrucipes* Fr.
Vasatorps skog, Hälsingborg, 12.10.1950.

8×7,5 cm, foten var 7 cm lång. Sedan dess har jag tyvärr ej återfunnit dem. Enbusken, under vilken svamparna växte, är borthuggen, men detta har troligen icke med svampens försvinnande att göra. Äldre ex. hade hatten svagt inbuktad. Lukten hos svampen var först angenäm, men ett plockat ex. hade efter några timmar en sötaktig, äcklig lukt. Ett torkat ex., som jag haft i ett kuvert sedan den 2.10.1949 har en från kryddlukt, svår att definiera.

Av ett visst intresse är, att den enda kända danska lokalen i Allerøds mosse och den i Vasatorp vid Hälsingborg blott ligger på c:a 30 km:s avstånd från varandra. För övrigt är ju den sällsynta svampen känd endast från ett fåtal lokaler i Europa, belägna på

stora avstånd från varandra. Dess sporadiska uppträdande är också en gåta. Intressant vore, om man genom mykologers medverkan i olika länder exakt kunde få reda på, när och var svampen funnits under t. ex. de sista 10 åren.

SUMMARY

Tricholoma verrucipes Fr. is found in Scania, Sweden.

Tricholoma verrucipes Fr. *(Clitocybe verrucipes* (Fr.) Maire) is only known from a few localities in Europe. In Sweden the species was found near Uppsala in the year 1870, in Gothenburg(?) and in the neighbourhood of the town of Hälsingborg during the years 1941—1950. In Denmark it was found 1944 (good description of the fungus), and in the 19th century it was found in Finland, France and Italy. It would be of great interest to known the exact localities of this rare, beautiful and peculiar fungus, f. i. during the latest 10-yearperiod in the different countries of Europe.

Hälsingborg, February 1956.

NÅGRA VÄSTSVENSKA SVAMPFYND

Av S. WOLDMAR

Svampfloran på Sveriges västkust har behandlats i arbeten av O. Rob. Fries, T. Nathorst-Windahl m. fl. Dess särdrag, präglade framför allt av ett maritimt klimat, kunna emellertid ännu knappast skönjas. I den mån uppgifter om fynd och fyndorter bli kända, klarnar dock bilden, och sammanställda med de mykofloristiska undersökningar, som gjorts i skilda delar av Sverige och i de övriga nordiska länderna, vidgas den växtgeografiska överblicken, och hittills outredda problem beträffande svamparnas förekomst kunna måhända härigenom lösas.

Föreliggande anteckningar avse fynd av anmärkningsvärda arter inom ett mindre område på den svenska västkusten, omfattande mellersta Bohuslän, speciellt Uddevallatrakten, och angränsande del av Västergötland (Vänersborg och V. Tunhem). Samtliga arter, som antecknats från området, ha ej kunnat medtagas, vilket hade varit önskvärt, då härigenom en bättre bild av floran hade kunnat erhållas.

Den av Lundell & Nannfeldt i „Fungi Exsiccati Suecici" använda nomenklaturen har jag sökt följa, så långt det varit möjligt.

Hymenomycetes

Amanita muscaria L. ex Fr. f. *aureola* Kalchbr. — Uddevalla, terrängen S om sjön Sarven, under björk och *Salix*, 5.10.1947. — Denna form stämmer väl med såväl text som avbildning (Pl. 3 C) hos J. E. Lange.

A. phalloides (VAILL. ex FR.) SECR. — Skaftö, Vägeröd, under ek, 27.7.1953. Även antecknad från S. Bohuslän (L. ÅKERBLOM in litt.): Marstrand, Koön, 1935 och flera följande år; Lycke, 1941.

A. virosa FR. — Uddevalla, Rosseröd sept. 1950; terr. S om Sarven, sept. 1952.

Amanitopsis adnata (W. G. SM. ap. SAUND. & SM.) SACC. — Uddevalla, Björbäck, i gräs under björk, sept. 1948 (det. A. MELDERIS), i grus intill björk (fig. 1), aug. 1953 (det. S. LUNDELL). — Artens taxonomi är omtvistad. Enl. LUNDELL (in litt.) bör den av mig funna arten t. v. betecknas som *Amanitopsis adnata* SMITH sensu COOKE, då den väl överensstämmer med COOKE's avbildning men icke med SMITH's ursprungliga beskrivning. Den stämmer även väl med LANGE's bild av den ringlösa formen (var. *exannulata*) av *Amanita junquillea* QUÉL. (Pl. 2 D), som emellertid växer i barrskog. Kategoriskt anmärker LANGE: „This is *Amanitopsis adnata* of W. G. SMITH. But even when the ring is entirely absent it cannot be mistaken for a true *Amanitopsis*".

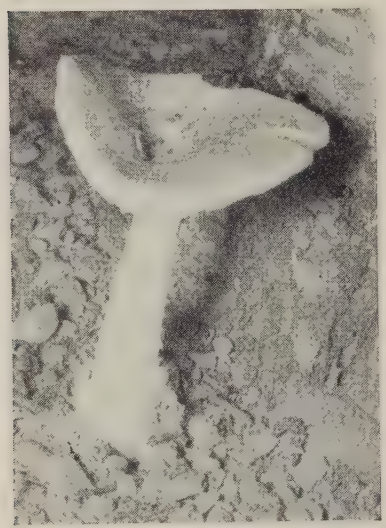


Fig. 1. *Amanitopsis adnata* SMITH sensu COOKE.
Uddevalla, Björbäck, Aug. 1953. Note the habitat! — Phot. by GUSTAF CARLSSON.

Conocybe striaepes (CKE) LUNDELL. — Uddevalla, Porsen, 14. 9. 1949 och flera följande år. — Det första svenska fyndet av denna calcifila art, som här växer i starkt snäckskalsbemängd jord. — Fung. exs. suec., n. 2049.

Mycena quisquilliaris (JOSS.) KÜHNER. — Uddevalla, Sarven, på *Phragmites*, sedan 1950 (det. R. RYDBERG) (Fig. 2). — Denna art har av RYDBERG observerats på *Carex paradoxa* m. fl. arter i kärr på Runmarö, Uppl., sedan 1948. Av JOSSERAND fördes den till *Omphalia* medan CEIP inrangerat den under *Delicatula*. En art som lätt förbises (hatt:

2—4 mm; fot 3—5 mm) och som säkerligen är allmännare än de fåtaliga fynden utvisa. Från Danmark är den noterad av MORTEN LANGE (Sjælland: Maglemose och Buresø, på *Molinia* och *Eriophorum vaginatum).*

M. bulbosa (CEIP) KÜHNER. — Vg. Vänersborg, på *Carex gracilis* i sjön Vassbotten sept. 1953 (det. R. RYDBERG). — Denna art, som är ny för Sverige, är mindre och har kortare fot än den närstående allmänna *M. stylobates.* Enl. RYDBERG (in litt.) igenkännes den på sin gelatinösa hatthud. Även denna art förbises lätt (storlek ung. som föregående).

Fig. 2. *Mycena quisquilliaris* (JOSS.) KÜHNER. Uddevalla, the lake Sarven, on *Phragmites,* Sept. 1955. × 3. Phot. by GUSTAF CARLSSON.

Pleurotus chioneus PERS. — Uddevalla, Björbäck, på förarbetat virke, okt. 1947, sept. 1948.

P. atrocoeruleus FR. ex FR. — Lane-Ryr. terr. NO om St. Köperödsjön, juli 1947, okt. 1948.

P. porrigens PERS. ex FR. — Ett flertal lokaler i Uddevallatrakten antecknade för denna art, som vissa år förekommer tämligen rikligt.

Marasmius limosus BOUD. & QUÉL. — Uddevalla, Sarven, på *Phragmites,* juli-okt. 1951—1955. — En liten art (hatt: 2—3 mm; fot: 10—15 mm, hårfin), lätt igenkänd på den för *Rotula*-gruppen karakteristiska lamellringen. Jfr. Ø. WINGE's vackra teckning av *M. rotula* i FERDINANDSEN & WINGE: Mykologisk Ekskursionsflora, 1943, p. 218! Artnamnet är missvisande, eftersom den ej växer i dyjord utan på fuktiga, vissna blad, strån o.d. J. E. LANGE har sett den på *Deschampsia caespitosa.*

Lentinus suavissimus FR. — Uddevalla, Gräskärr, sept. 1946; terr. S om Sarven, sept. 1947; Björbäck, flera lokaler 1947 och de följande

åren; Grindhult, skogen Ö om Grindsjön, 2. 12. 1949; Lane-Ryr, terr. V om Hukeberg, sept.-nov. 1947. På samtliga lokaler på *Salix*. — Av lokaluppgifterna framgår, att denna svamp ej är ovanlig i Uddevallatrakten. I övriga delar av Sverige torde den dock vara sällsynt, vilket framgår av HARRY G. SVENSSON's sammanställning av tidigare fynd (SVENSSON 1944). Dessa uppgå till ett 10-tal. Troligen är den förbisedd p. g. a. sin förekomst i ± täta *Salix*-snår och allmännare i västra Sverige än i övriga delar av landet. NATHORST-WINDAHL (1949) har sett den på flera ställen i Göteborgstrakten. — Fung. exs. suec., n. 1774.

Panus torulosus (PERS. ex FR.) FR. — Uddevalla, terr. S om Sarven, sept.-okt. 1947 och flera följande år. — Fung. exc. suec., n. 1771.

Schizophyllum commune FR. — Uddevalla, skogen Ö om Björbäcks gård, på asp, 1. 12. 1948; Salekärr, på asp, 5. 5. 1953.

Trogia crispa (PERS. ex FR.) FR. — Uddevalla, skogskant c:a 300 m Ö om Björbäcks skola, 19.11.1948.

Asterophora parasitica (BULL. ex FR.) SING. — Skaftö, Vägeröd, på *Russula delica,* 17. 8. 1953. S. å. rikligt i V. Tunhem, där den tidigare (1944) anträffats av NATHORST-WINDAHL. Denna säregna svamp, som ej anträffats utanför ekens nordgräns (WOLDMAR 1954), synes vara beroende av hög luftfuktighet. Under den torra hösten 1955 stod ej något exemplar att finna vare sig i V. Tunhem eller vid Vägeröd.

A. lycoperdoides FR. ex FR. — Forshälla, Stenshult, på *Russula nigricans,* 21.9.1946 och de följande åren t. o. m. 1954. En storvuxen form (LANGE's f. *major?)* har jag antecknat från denna lokal 29.9. 1949.

Cantharellus umbonatus PERS. ex FR. — Liksom *C. aurantiacus* synes denna svamp „ersätta" vanlig kantarell under torra höstar. Så var fallet i Uddevallatrakten 1947 och 1955.

Entoloma bahusiense LUNDELL. — Uddevalla, Björbäck. — En intressant *E. clypeatum* närstående art, som årligen 1948—1953 före-

kom rikligt på ett begränsat område. 1954 och 1955 syntes den ej till. Märklig är den korta fruktifikationstiden, c:a 10 dager, i slutet av maj. — Fung. exs. suec., n. 2007 (originalkoll.).

Stropharia Hornemannii Fr. — Uddevalla, S och SV Sarven, i enstaka ex. under åren 1947—1953 och tämligen rikligt hösten 1955; Lane-Ryr, terr. V om St. Köperödsjön, okt. 1948.

Coprinus Friesii var. *(C. Friesii* Quél.?). — Uddevalla, Sarven, på *Phragmites* 26. 6. 1950, även 1951—1954. — Enl. Lundell (in litt.) är det ovisst om detta är Quélet's art.

Hydnum corrugatum Fr. — Uddevalla, S om Sarven, på björk, juli 1948; Lane-Ryr, Skälleröd, på björk, sept. 1948.

Clavaria abietina Pers. var. *flaccida*. — Lane-Ryr, Köperöd, sept. 1950. (Det. S. Lundell, som även bestämt de följande *Clavaria*-arterna utom *C. botrytis)*.

C. botrytis Pers. — Uddevalla, skogskant S om Björbäcks gård, sept. 1946 (det. T. Nathorst-Windahl); Kuröd, sept. 1948.

C. crocea Fr. — Uddevalla, Björbäck, 1. 9. 1953. — Det andra svenska fyndet. Tidigare har den anträffats av Nathorst-Windahl i Bot. Trädgården i Göteborg.

C. epichnoa Fr. — Uddevalla, Gräskärr, sept.-nov. 1947—1949.

C. inaequalis Müll. — V. Tunhem, 20. 8. 1953.

C. rugosa Bull. — Forshälla, i barrskog V om Öresjön, 18. 9. 1940.

C. corniculata Schaeff. ex Fr. — Uddevalla, Kuröd, på skalgrus, 31. 8. 1953.

C. corniculata forma (?). — V. Tunhem, aug. 1953. — En intressant form, habituellt lik *C. corniculata* men gråblek och med 2-sporiga basidier.

C. subtilis Pers. ex Fr. — Uddevalla, Björbäck, i mossa vid ormbunksrötter, 1. 9. 1953.

C. pulchra Peck. — V. Tunhem, 1. 9. 1953.

Fig. 3. *Clavaria cineroides* ATKINSON or a related species. Västerg. V. Tunhem, 20.8.1953. × 4. Phot. by GUSTAF CARLSSON.

Clavaria sp. — V. Tunhem, 20.8.1953. — Enl. LUNDELL (in litt.) ny art eller *C. cineroides* Atkinson. (Fig. 3).

Solenia crocea KARST. — En förbisedd svamp, som synes förekomma tämligen allmänt på äldre ex. av *Matteuccia struthiopteris* (WOLDMAR 1954). Jag har även funnit den på *Matteuccia* vid Farum, Sjælland, 5. 8. 1954, vilket är det första danska fyndet.

Peniophora subcalcea Litsch. — Uddevalla, Gräskärr, 20.5.1950. — En intressant art, som ej tidigare uppmärksammats i Sverige. Det. E. RUTH DEARDEN och H. S. JACKSON, Toronto, som även haft tillgång till LITSCHAUER's typmaterial. Bestämningen har också bekräftats av JOHN ERIKSSON.

Discomycetes

Cudonia confusa BRES. — Lane-Ryr, i skogen S om St. Abborrvattnet, 5. 9. 1950 (det. S. LUNDELL). En sammanställning av tidigare

skandinaviska fynd har gjorts av J. A. NANNFELDT (1942).

Cyathicula coronata (BULL.) REHM. — Uddevalla, St. Uggelhult, på *Matteuccia,* 23.9.1954 (det. J. A. NANNFELDT); Ramseröd, på *Dryopteris filix mas* 15.10.1954.

Rhizopodella melastoma (SOW. ex FR.) RICHON. — Uddevalla, Björbäck, på ljungrötter, 30.4.1949, i enstaka ex. även flera följande år (det. J. A. NANNFELDT). — Artens taxonomi och förekomst i Skandinavien behandlad av NANNFELDT (1949), som anser att den intar en mellanställning mellan *Urnula* och *Bulgaria.* (Fig. 4).

Fig. 4. *Rhizopodella melastoma* (SOW. ex FR.) RICHON.
Uddevalla, Björbäck, April 1953. ×4. Phot. by GUSTAF CARLSSON.

Plectascales

Onygena equina WILLD. — Uddevalla, Gräskärr, terr. SV om St. Köperödsjön, på ruttnande horn, 13.12.1948.

Professor J. A. NANNFELDT, Uppsala, har hjälpt mig med artbestämningar och lämnat mig värdefulla uppgifter och goda råd under flera år. Hjälp med examinering har jag också fått av fil. dr. SETH LUNDELL, Uppsala, trädgårdsdirektör T. NATHORST-WINDAHL, Göteborg, lektor JOHN ERIKSSON, Värnamo, och disponent R. RYDBERG, Stockholm. Min vän, folkskollärare GUSTAF CARLSSON, Uddevalla, har ställt de vältagna fotografierna till mitt förfogande. Till alla ett varmt tack.

SUMMARY

Notes on Macromycetes from Western Sweden.

The author reports about forty finds of *Hymenomycetes, Discomycetes,* and *Plectascales* (one species) from the Swedish West Coast, especially from the district round Uddevalla. The following species are new to Sweden: *Conocybe striaepes* (CKE.) LUNDELL, *Mycena bulbosa* (CEIP) KÜHNER, *Entoloma bahusiense* LUNDELL, *Peniophora*

subcalcea LITSCHAUER, and one *Clavaria* sp., probably *C. cineroides* ATKINSON. A number of species, for instance *Mycena quisquilliaris* (JOSS.) KÜHNER and *M. bulbosa* (CEIP) KÜHNER, *Marasmius limosus* BOUD. & QUÉL., *Rhizopodella melastoma* (SOW. ex FR.) RICHON, *Solenia crocea* KARST., and *Cyathicula coronata* (BULL.) REHM seem to have been overlooked, owing to their smallness and/or their special way of growing. A find of *Solenia crocea* KARST. is also reported from Denmark, where it has not been met with previously.

LITTERATUR

Ferdinandsen, C. & Winge, Ø., (1943): Mykologisk Ekskursionsflora. — København.

Fries, O. Rob., (1907): Anteckningar om Svenska Hymenomyceter. — Ark. f. bot., Bd. 6, N:o 15. Stockholm.

Lange, Jakob E., (1935—1940): Flora Agaricina Danica. Vol. I—V. — København.

Lange, Morten, (1946): Mykologiske Iagttagelser i Danmark 1943—1945. — Friesia. Bd. III, H. 3. København.

Lundell, S. & Nannfeldt, J. A., (1934—1953): Fungi exsiccati suecici, ... Fasc. I—XLII. (pro parte). — Uppsala.

Nannfeldt, J. A., (1942): The Geoglossaceae of Sweden (with regard also to the surrounding Countries). — Ark. f. bot., Bd. 30 A., N:o 4. Stockholm.

— , (1949): Contributions to the Mycoflora of Sweden 7. A new winter Discomycete, Urnula hiemalis Nannfeldt n. sp., and a short account of the Swedish species of Sarcoscyphaceae. — Sv. Bot. Tidskr. Bd. 43. Stockholm.

Nathorst-Windahl, T., (1945): Anmärkningsvärda fynd av Hymenomyceter i Bohuslän och Västergötland. — Meddel. fr. Göteborgs Bot. trädgård. Bd. 16. Göteborg.

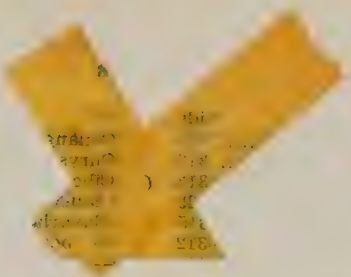
— , (1949): Anmärkningsvärda fynd av Hymenomyceter i Bohuslän, Västergötland och Dalsland. — Bot. Not. h. 3. Lund.

Svensson, Harry G., (1944): Anteckningar om Karlstadtraktens skivlingflora II (Broskskivlingar: Marasmiae och rödsporingar: Rhodosporae). — Medd. fr. Värmlands Naturhist. För. 15: 1. Karlstad.

Woldmar, S., (1954 a): Om utbredningen i Norden av gråkremling, Asterophora parasitica (Bull. ex Fr.) Sing. — Sv. Bot. Tidskr. Bd. 48. Stockholm.

— , (1954 b): Solenia crocea Karst. — en förbisedd svamp-art. — Friesia. Bd. V, H. 1. København.

Björbäck, Uddevalla, januari 1956.



REGISTER

Fortegnelse over sjældnere eller nærmere omtalte Slægter, Arter, Varieteter og Former af Svampe samt Synonymer i Bind 5 (1954—1956).

De i T. NATHORST WINDAHL's Afhandling »Zur Verbreitung der Agaricales in den Wäldern des südwestlichen Schwedens« omtalte Svampearter er ikke medtaget i nedenstaaende Register; der maa her henvises til Afhandlingens udførlige Artsfortegnelser Side 321—324.

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